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| <p>(54) Title: METHOD AND APPARATUS FOR SYNCHRONIZING, DISPLAYING AND MANIPULATING TEXT AND IMAGE DOCUMENTS</p> <p>(57) Abstract</p> <p>The present invention provides a method and apparatus for extracting, synchronizing, displaying, and manipulating text and image documents in electronic form for display. In the preferred embodiment of the present invention, text and image files for documents, such as for example patent documents, are initially stored on separate magnetic tape media. These data files are extracted from the respective tapes and placed onto a faster medium, such as a hard disk drive. The text and image files are synchronized to produce Equivalent Files using heuristic algorithms to create an approximate equivalence relationship between the text and the image files. The Equivalent Files and image files residing on, for example, a hard disk drive or compact disk (CD), are coupled as a resource to a computer display system. The graphic user interface of the present invention permits the user to display, manipulate, and edit the Equivalent File created using the process of the present invention, and to simultaneously view the image file on the display. Using the graphic user interface of the present invention, a user may create libraries of patent Equivalent Files and image files or documents of another type, as well as open cases to include a plurality of different patents or other documents. The Equivalent File may be selectively viewed on the display in an equivalent window. Simultaneous with the viewing of the Equivalent File within the equivalent window, the user may view any portion of an image file within one or more image windows on the display. A variety of other features and functions are provided by the present invention for the manipulation and display of patent documents and other documents on the user interface.</p> |  |  |   |

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## Method and Apparatus for Synchronizing, Displaying and Manipulating Text and Image Documents

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### *Background of the Invention*

#### 10 *Field of the Invention*

This is a Continuation-In-Part application of pending application Serial No. 08/155,752 filed November 19, 1993.

15 The present invention relates to the fields of publishing, document editing and manipulation, and displaying documents and images. More particularly, the present invention relates to paginating, extracting, synchronizing, and displaying, a document in electronic form.

#### *Art Background*

20 As the development of multimedia computer display systems continues to advance, more computing power and features are available to computer users. For example, information which has historically been limited to published paper documents is now being made available through on-line computing services from publishers and information vendors. As an increasing market share of the data and computing capacity is provided through low cost high performance personal computers, some of the on-line information is also being made available in compact disks (CD) and magnetic media formats. Compact disk and magnetic media technology offer cost effective mass storage of documents, images and other data, in a format readily accessible for use with personal computers in a home or office environment. The combination of personal computers, compact disk

technology and multimedia interactive graphic user interfaces, permits the access and display of textual and graphic information by personal computer (PC) users in a manner not previously known in the industry. The type of information potentially available to a PC user includes professional and 5 technical publications, newspapers, magazines, and other scientific and literary data and images.

However, much of the information which is published through, for example, government sources, newspapers and magazines is not in machine readable form, but rather is printed on paper. Because of the amount of work 10 and effort required to convert the printed information into a machine readable form, only a small portion of the total published information is currently available for use by PC users using magnetic disks, CDs and the like. In addition, the information which is in machine readable form is typically available either as an image of the original document or as a stream of text 15 data. An image of a document has the advantage of presenting the information in its original format as published, including non-text material, such as drawings, equations, symbols, diagrams, etc. The viewer is familiar with the format, and the information is easily recognized and understood. However, since a document image is often stored as a bitmap, the content of the 20 document cannot be easily searched or manipulated. Alternatively, a text data stream format has the advantage of presenting the information in a manipulable and searchable format. Unfortunately, in many cases, the format of presentation is not the format in which the information was originally published in print. Thus, the users are often unfamiliar with the format, 25 inhibiting easy navigation of the document making information difficult to find and use.

One example of the problem of reproducing originally published 30 documents stored in machine readable form, is the storage and display of United States patent documents by the United States Government. The United States Patent Office (herein referred to as the "PTO") provides magnetic tapes of issued U.S. patents and other documents, in the form of a scanned in

image, and as a separate stream of text data. The magnetic tape storing the text data does not include graphical illustrations such as drawings, charts, textual tables, or much in the way of formatting data. Thus, the reproduction of a United States patent from PTO Text Files stored on magnetic tape does not result in the display of a U.S. patent as originally published by the U.S. Government. An example of a well known system for displaying text files provided by the PTO is that of the LexPat® system provided by Mead Data offered in conjunction with the Lexis® display system. Using the LexPat® system, the display of a U.S. patent on a terminal, such as a PC, results in a display of text only, and does not include drawings, charts, graphs, or original 5 formatting information. The text of a selected patent appears in ASCII format, but does not appear as the original patent issued by the PTO, and may not be referenced by the original column and line numbers from the published patent. Other systems display text files of periodicals such as the Wall Street Journal 10 or legal documents such as contracts. However, the text files do not appear 15 as the original documents.

The U.S. Patent Office also provides magnetic tapes with image files comprising a scanned in image of the original U.S. patent issued by the PTO and published by the U.S. Government. The image files provided on magnetic 20 tape by the PTO simply represent a bitmap image of the original published patent. As a scanned in image, the entire patent is provided including drawings, charts, graphs, text and the original format, since it represents a simple bitmap of the scanned original document. However, a scanned 25 document may not be easily searched, edited, navigated or otherwise manipulated as can a text file.

As will be described, the present invention provides a method and apparatus for extracting, synchronizing, displaying, navigating and manipulating text and image documents simultaneously in electronic form. The present invention is described with particular reference for use with U.S. 30 patent documents, and includes the process of extracting patent text and image data from magnetic tapes provided by the PTO, synchronizing the text and

image data for recovering the original format (i.e., columns and lines) of the original published patent, and displaying the formatted text along with images using a unique graphical user interface (GUI) workbench. Although the present invention is described with reference to patent documents, it will be  
5 appreciated that the invention has application to a variety of different types of documents and applications.

The present invention's graphical user interface permits a user to selectively view ASCII text documents as well as bitmapped scanned images simultaneously on a display. When used in conjunction with U.S. patent  
10 documents, the graphic user interface of the present invention allows a user, such as a patent attorney, to display and manipulate both textual as well as graphic portions of patents. The text of a patent may be viewed on the display as it was originally published by the PTO, including column and line numbers. Simultaneously, the user may view the figures of a patent in the form of an  
15 image comprising a bitmap. Various functions are provided by the present invention for viewing, manipulating and displaying the patent documents. In order to assist the reader in understanding of graphic user interface (GUI) technology, it is suggested that certain references be considered for background. Many user interfaces utilize metaphors in the design of the  
20 interface as a way of maximizing human familiarity, and conveying information between the user and the computer. As for the use of familiar metaphors, such as desktops, notebooks, spread sheets, and the like, the interface takes advantage of existing human mental structures to permit a user to draw upon the metaphor analogy to understand the requirements of the  
25 particular computer system. (See for example, Patrick Chan "*Learning Considerations in User Interface Design: The Room Model*", Report CS-84-16, University of Waterloo, Computer Science Department, Ontario, Canada, July, 1984 and the references cited therein.) In addition, the reader is referred to the following references which describe various aspects, methods and  
30 apparatus associated with prior art graphic user interface design: U.S. Patent

Re.32,632; U.S. Patent 4,931,783; U.S. Patent 5,072,412; and U.S. Patent 5,148,154, and the references cited therein.

As will be described more fully below, the present invention's graphic user interface is based on a desktop "windows" metaphor, and provides the user with the ability to simultaneously display text and image documents in both a synchronized and unsynchronized fashion, as will be more fully described herein.

### *Summary of the Invention*

The present invention provides a method and apparatus for extracting, synchronizing, displaying, and manipulating text and image documents in machine readable form for display. In the preferred embodiment of the present invention, text and image files for documents, such as for example patent documents, are initially stored on separate magnetic tape media. These data files are extracted from the respective tapes and placed onto a faster medium, such as a hard disk drive. Catalogs are generated of the contents of the tapes and procedures are provided for locating and loading tapes from a tape inventory. The text and image files are synchronized to produce Equivalent Files using heuristic algorithms to create an approximate equivalence relationship between the text and the image files. In the presently preferred embodiment, the automatic pagination of the text and image files provides an equivalence relationship, and a final Equivalent File is obtained through human intervention to correct any inaccuracies still remaining after the automatic process has been completed. However, the present invention also contemplates an entirely automatic pagination process which would require no human intervention to obtain a usable Equivalent File. A word based inverted tree index is created for the text files to allow for very fast text searching using a graphic user interface (GUI) workbench.

The Equivalent Files and image files residing on, for example, a hard disk drive or compact disk (CD), are coupled as a resource to a computer

display system. The computer display system includes a computer having a central processing unit (CPU) coupled to memory and input/output (I/O) circuitry. The computer is also coupled to a CD ROM, hard disk drive, or other mass memory device onto which the Equivalent File and image file have been stored. The computer is coupled to a display, such as a cathode ray tube (CRT) or liquid crystal display, as well as a keyboard and a cursor control device. The graphic user interface of the present invention is displayed by the computer on the CRT, and includes a menu bar and a tool bar, each bar having a plurality of command options for selection by a user. The graphical user interface of the present invention permits the user to display, manipulate, and navigate the Equivalent File created using the process of the present invention, and to simultaneously view the image file on the display. In accordance with the teachings of the present invention, the Equivalent File may be synchronized with the image file, or alternatively, an Equivalent File may be displayed along with a completely separate and distinct image (for example, viewing the Equivalent File of one patent while viewing the image file of another patent). Once created, and as shown on the display, the Equivalent File is displayed in substantially the same column and line format as a printed patent published by the U.S. Government.

Using the graphic user interface of the present invention, a user may create libraries of patent text Equivalent Files and image files, as well as open cases to include a plurality of different patents or other documents. The Equivalent File may be selectively viewed on the display in an equivalent window. The Equivalent File may be navigated, highlighted, searched, and otherwise annotated using highlights, patent and case notes. Simultaneous with the viewing of the Equivalent File of a patent within the equivalent window, the user may view the exact portion of the image file corresponding to the display of the Equivalent File, or any portion of an image file within one or more image windows on the display. The present invention further provides search mechanisms for defining and searching key words chosen by the user or selected from the Equivalent File, or a word list. Boolean and

proximity searches may also be performed on the Equivalent File and the results displayed. The search terms may be used to search documents within the equivalent window of a current Equivalent File, current library of documents, documents notes (referred to herein as "patent notes" and/or "case notes"), as well as other selected cases. The word list includes an alphabetical list of all words within the selected library, document or the like. The present invention also permits the user to display an image, for example a patent drawing image, within the image window by placing a cursor in the text of a patent Equivalent File and signaling the computer. In response to this signal, the computer displays the last referenced figure drawing within the image window. The interface of the present invention also permits the user to select portions of text and/or drawings within the image window, and enlarge or reduce the selected image for viewing by the user. The interface further permits the user to select any element number appearing on the patent drawings in the image window. The selection of an element number in a patent drawing results in the automatic highlighting of the first and every subsequent occurrence of that element number in the Equivalent File comprising a specification and claims of the selected patent equivalent displayed in the equivalent window. Additionally, multiple patents, drawings and/or other documents may be viewed simultaneously on the display in accordance with the teachings of the graphic user interface comprising the present invention. A variety of other features and functions are provided by the present invention for the manipulation, navigation and display of patent documents on the user interface. The user may display either a synchronized Image File wherein the image displayed is synchronized with the Equivalent file displayed, or an unsynchronized Image File wherein the image displayed is at some page other than the one containing the column of text in the Equivalent File. A user may also copy and paste a portion of, or the whole, Equivalent File to notes of third party programs, such as word processors or drawing programs as well as allowing the user to import ASCII text into the notes from third party systems, such as deposition testimony in ASCII format

into patent notes that relate to the topic of the testimony. Particularly when using the present invention with patents, it may be used to facilitate patent searching in the preparation and prosecution of patents, licensing of patents, litigation of patents, conducting infringement and validity studies of patents, 5 producing infringement claim charts, managing and valuing a portfolio or group of patents, conducting 35 U.S.C. SS 112 searches on patents or pending applications, and many other uses which are regularly performed by a patent attorney, patent agent or technical personnel.

### *Notation and Nomenclature*

10 In some of the detailed descriptions which follow, the present invention is presented partly in terms of interface display images, process steps, and symbolic representations of operations of data bits within a computer memory. These algorithmic descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the substance of 15 their work to others skilled in the art.

An algorithm is here, and generally, conceived to be a self-consistent sequence of steps leading to a desired result. These steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities may take the form of electrical or magnetic signals capable of 20 being stored, transferred, combined, compared, displayed and otherwise manipulated. It proves convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, images, terms, numbers, or the like. It should be borne in mind, however, that all of these similar terms are to be associated with the appropriate physical 25 quantities and are merely convenient labels applied to these quantities.

In the present invention, the operations referred to are machine operations performed in conjunction with a human operator. Useful machines for performing the operations of the present invention include general purpose digital computers, digitally controlled displays or other similar devices. In all

cases, the reader is advised to keep in mind the distinction between the method of operating a computer and/or display system, and the method of computation itself. The present invention relates to methods for operating a computer and interactive display system, and processing electrical or other physical signals to generate other desired physical signals.

The present invention also relates to apparatus for performing these operations. This apparatus may be specially constructed for the required purposes or it may comprise a general purpose computer selectively activated or reconfigured by a computer program stored in the computer. The method steps presented herein are not inherently related to any particular computer or other apparatus. Various general purpose machines may be used with programs in accordance with the teachings herein, or it may prove more convenient to construct specialized apparatus to perform the required method steps. As such, no particular programming language is provided, as any one of a variety of languages may be utilized to implement the invention. The required structure for a variety of these machines and programming environments will be apparent from the description given below.

### *Brief Description of the Drawings*

FIGURE 1 is a block diagram of production configuration to extract text and image files, paginate the text files with the image files to produce Equivalent Files, and index the Equivalent Files.

FIGURE 2 is a flow chart illustrating the sequence of steps utilized by the present invention to extract text and image files, paginate the text files with the image files to produce Equivalent Files, index the Equivalent Files and display the Equivalent Files and/or Image Files on a display.

FIGURE 3 is a functional block diagram illustrating a computer display system incorporating the teachings of the present invention.

FIGURE 4 illustrates an enlarged portion of an image file comprising the bibliography page of United States Patent 5,165,027.

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FIGURE 5 illustrates a sample portion of a PTO Text File for Patent 5,165,027 illustrated in Figure 4.

FIGURE 6 illustrates an example of the column information listed in the PTO Text File for the Patent 5,165,027 illustrated in Figures 4 and 5.

5 FIGURE 7 illustrates the paragraph shown in Figure 6 as it is stored in the PTO Image File for Patent 5,165,027.

FIGURE 8 illustrates the column line number information provided by a published United States patent.

10 FIGURE 9 illustrates a flow chart block diagram of the extraction process utilized by the present invention to extract PTO Text Files and PTO Image Files for magnetic tapes provided by the PTO for use by the processing system of the present invention to synchronize and index the text and image files.

15 FIGURE 10 is a flow chart illustrating the pagination process of the present invention to synchronize the PTO Text File and the PTO Image File to produce an Equivalent File.

FIGURE 11 illustrates the user interface of the present invention upon system start including the title, menu and tool bars.

20 FIGURE 12 illustrates the selection by a user of a down arrow function to open a list of available cases.

FIGURE 13 illustrates the present invention's use of information arrows to direct the user to currently available options for execution.

25 FIGURE 14 illustrates the patent text toolbox of the present invention and the display of a menu of patent section headings to assist the user in navigating a selected patent.

FIGURE 15 illustrates the sub-command items available for selection by a user upon activating the Library menu option.

30 FIGURE 16 illustrates the Set Library Directories dialog box, displayed after selection of the Set Library Directories sub-command item on the Library menu.

FIGURE 17 illustrates the New Library dialog box.

FIGURE 18 illustrates the Open Library dialog box.

FIGURE 19 illustrates the present invention's Library dialog box for working with the library currently in use.

FIGURE 20 illustrates the selection of a patent within the Intel® Library.

FIGURE 21 illustrates the present invention's minimization of a library to an icon.

FIGURE 22 illustrates the present invention's Update Library dialog box for updating the library currently in use, which in the present example, the Intel® Library.

FIGURE 23 illustrates the present invention's Search Library dialog box which is displayed upon selection of the Search sub-command item from the library menu.

FIGURE 24 illustrates the present invention's Word List dialog box which is displayed upon the activation of the Word List button function within the Search library dialog box.

FIGURE 25 illustrates the operation of the present invention's Word List dialog box for selecting an alphabetical tab and viewing the corresponding list of words from the library patents.

FIGURE 26 illustrates the present invention's Search Results dialog box identifying the number of occurrences of the search term defined by the user in each of the library patents.

FIGURE 27 illustrates the present invention's Library to Case Cross Reference dialog box.

FIGURE 28 illustrates the present invention's Patent Text Toolbox for operating upon Equivalent Files displayed in an equivalent window.

FIGURE 29 further illustrates the present invention's Patent Text Toolbox for operating upon the Equivalent File within the equivalent window.

FIGURE 30 illustrates the present invention's simultaneous display of an equivalent window and an image window, as well as the display of a Patent Image Toolbox for operating upon images displayed within the image window.

FIGURE 31 illustrates the present invention's simultaneous and synchronized display of an Equivalent File in an equivalent window and enlarged image displayed in an image window on the display screen.

5 FIGURE 32 illustrates the display of patent section headings and the ability of a user to navigate the patent sections displayed within the equivalent window through the selection of section headings.

10 FIGURE 33 illustrates the present invention's synchronization of an Equivalent File displayed in the equivalent window with the drawings of a patent disposed in an image file displayed in an image window on the display screen. The present invention links references to the figure numbers in the Equivalent File to the figures in the image file displayed in the image window.

FIGURE 34 illustrates the present invention's use of an outline box to identify an area of the patent image to be enlarged.

15 FIGURE 35 illustrates the present invention's user interface in which an Equivalent File is displayed in an equivalent window, and simultaneously, an enlarged portion of a figure from the image file is displayed in the image window on the display screen.

20 FIGURE 36 illustrates the present invention's Select Element Number dialog box, which permits a user to input a drawing element and locate the first occurrence and the subsequent occurrences of the drawing element in the Equivalent File displayed in the equivalent window.

FIGURE 37 illustrates the present invention's use of highlighting to highlight desired portions of the Equivalent File in various colors.

25 FIGURE 38 illustrates the present invention's display of two equivalent windows and one image window on the display screen.

FIGURE 39 illustrates the Import Patents dialog box of the present invention.

FIGURE 40 illustrates the Import Patents dialog box after the selection of an Equivalent File to be imported.

30 FIGURE 41 illustrates sub-command items available for selection upon the activation of the Case menu option.

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FIGURE 42 illustrates the Open Case dialog box which is displayed once the Open Case sub-command item illustrated in Figure 41 is selected.

FIGURE 43 illustrates the New Case dialog box which is displayed upon the selection of the New Case sub-command item illustrated in Figure 41.

FIGURE 44 illustrates the patent number drop down menu which permits a user to select a patent within a case for displaying.

FIGURE 45 illustrates the Update Case dialog box which is displayed upon the activation of the Update Case sub-command item illustrated in Figure 41.

FIGURE 46 illustrates the search case dialog box which is displayed upon the selection of the Search sub-command item of the Case menu illustrated in Figure 41.

FIGURE 47 illustrates the Set Case Directories dialog box which is displayed upon the activation of the Set Case Directories sub-command item illustrated in Figure 41.

FIGURE 48 illustrates the Copy to Case dialog box which is displayed upon the selection of the Copy Case sub-command item illustrated in Figure 41.

FIGURE 49 illustrates the Backup Case dialog box which is displayed upon the activation of the Backup Case sub-command item of Figure 41.

FIGURE 50 illustrates the Delete dialog box which is displayed upon the selection of the Delete Case sub-command item illustrated in Figure 41.

FIGURE 51 illustrates the Print dialog box of the present invention which is displayed upon the activation of the Print sub-command item illustrated in Figure 41.

FIGURE 52 illustrates the Print Setup dialog box which is displayed upon the activation of the Print Setup sub-command item illustrated in Figure 41.

FIGURE 53 illustrates the sub-command items available for selection upon the activation of the Edit command option.

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FIGURE 54 illustrates the sub-command items available for selection by a user upon the activation of the View command option.

FIGURE 55 illustrates the Preferences dialog box displayed upon the activation of the Preferences sub-command item of Figure 54.

5 FIGURE 56 illustrates the Screen Layout dialog box which is displayed upon the selection of a Screen Layout sub-command item of Figure 54.

FIGURE 57 illustrates the user interface of the present invention upon the selection of the Screen Layout of the Screen Layout dialog box illustrating one equivalent window and one image window on the display screen.

10 FIGURE 58 illustrates the user interface of the present invention in which two equivalent windows are displayed side by side on the display screen after selection of Screen Layout of the Screen Layout dialog box.

15 FIGURE 59 illustrates the graphic user interface of the present invention in which two equivalent windows and two image windows are displayed on the display screen subsequent to the selection of Screen Layout of the Screen Layout dialog box.

FIGURE 60 illustrates the sub-command items available for selection upon the activation of the Window command option.

20 FIGURE 61 illustrates the patent note menu of the present invention which displays all patent notes which have been generated by a user.

FIGURE 62 illustrates a patent note of the present invention.

FIGURE 63 illustrates the present invention's use of multi-notes wherein multiple patent notes may be created within a single patent note.

FIGURE 64 illustrates the present invention's case note.

25 FIGURE 65 illustrates the minimization of exemplary documents, such as search results and the like on the display of the present invention.

FIGURE 66 illustrates the present invention's Go To Section dialog box which permits a user to input a patent column number and upon activation, results in the display of the column in the Equivalent File corresponding to the desired patent column.

FIGURE 67 illustrates the present invention's Go To section dialog box which permits a user to select a section of the patent and upon activation, results in the display of the selected section in the Equivalent window.

5 FIGURE 68 illustrates the sub-command items available for selection by a user upon the activation of the Help command option.

FIGURE 69 illustrates the About dialog box which is displayed upon the activation of the About sub-command item illustrated in Figure 68.

FIGURE 70 illustrates the sub-command items which are available for selection by a user upon the activation of the Note command option.

10 FIGURE 71 illustrates the case notes in Case dialog box which is displayed upon the selection of the View Case Note sub-command option illustrated in Figure 70.

15 FIGURE 72 illustrates the patent notes in Case dialog box which is displayed upon the selection of the View Patent Note sub-command item illustrated in Figure 70.

FIGURE 73 is a simplified block diagram of a computer system according to a preferred embodiment of the present invention.

20 FIGURE 74 is a flowchart depicting the preferred manner in which data transfer operations occur between machines in the computer system of FIGURE 73.

FIGURES 75, 76A, and 76B are used to describe the manner in which PTO Image files are compressed according to a preferred embodiment of the present invention.

25 FIGURES 77 and 78 are flowcharts depicting the manner in which pagination is performed according to a preferred embodiment of the present invention.

FIGURES 79 and 80 are used to describe a "Copy Claims" option preferably provided by the user interface of the present invention.

30 FIGURES 81 and 82 are used to describe a "Zoom Image" option preferably provided by the user interface of the present invention.

FIGURE 83 is used to describe a "Copy Image" option preferably provided by the user interface of the present invention.

FIGURE 84 is used to describe a "Lock Windows" option preferably provided by the user interface of the present invention.

5 FIGURES 85A and 85B are used to illustrate the preferred manner in which the present invention performs clumping.

FIGURE 86 is used to illustrate the preferred manner in which the present invention performs character stream matching.

### *Detailed Description of the Invention*

10 In the following description, numerous specific details are set forth such as functional blocks, representative data processing devices, window configurations, specific patent documents, text and drawings, etc., to provide a thorough understanding of the present invention. However, it will be apparent to one skilled in the art that the present invention may be practiced 15 without these specific details. In other instances, well known circuits and structures are not described in detail in order not to obscure the present invention unnecessarily.

20 The present invention will be described in various sections including a discussion of the general system configuration, the tape extraction process, the pagination process, the indexing process, and the graphic user interface. It is to be understood that although the following description is directed to U.S. patent documents, the present invention is not limited to patents, and has application to a variety of documents and images, as may be required by a particular application, such as for example, legal contracts, the Wall Street 25 Journal, The Los Angeles Times, etc.

### *General Overview of the Invention*

The general system configuration of the present invention discloses one possible implementation of the present invention for the display, navigation, manipulation and editing of text and image data in a graphical user interface. 5 As will be described, the general system configuration describes a computer display system which may be in the form of a personal computer, workstation, or dedicated processor system to permit the user to utilize the teachings of the present invention. No particular computer hardware is described within this specification, and the general system configuration description is intended to 10 encompass a broad range of possible data processing systems in which the present invention may be implemented.

A general overview of the system of the present invention is shown in Figure 1, and a flow chart of the primary process steps comprising the method of the present invention is illustrated in Figure 2.

15 The tape extraction process of the present invention extracts data files from PTO text and PTO Image File magnetic tapes provided by the PTO. The data files are extracted from these tapes onto a faster medium (such as a hard disk drive) to provide access times which are useful in modern data processing systems. As will be described, the process of extraction involves 20 appropriately generating catalogues and inventories of the contents of the tapes, as well as procedures for selecting and loading tapes from the newly created tape inventories.

25 The process of paginating the PTO Text Files and the PTO Image Files to produce "Equivalent Files" is performed by using a heuristic set of algorithms to automatically create an approximate equivalent relationship between the text and image files. A human operator verifies the results to finalize the Equivalent File, such that the original formatting of the published patent document is reflected in the Equivalent File.

30 As will be described, a process for creating an inverted tree index for the text contained in the PTO Text Files is disclosed. This indexing process

results in a pre-built index for very fast text searching when using the graphic user interface of the present invention. Although the present invention describes an inverted tape index, other types of text searching methods may be employed, instead of the inverted tape index.

5        The graphic user interface ("GUI") of the present invention displays the Equivalent File and the PTO Image File, and allows the user to perform analysis on the displayed files or other stored files. The Equivalent File is formatted and displayed with a similar appearance to the PTO Image File, having the same column and line formatting as the published patent. The user may then, for example, use the GUI to perform text searches to generate accurate column and line citations, navigate the Equivalent File via section 10      headings to locate desired sections of text, as well as to view the figures or text images in the displayed files or other stored files. Images and equivalent patent text may be viewed either in a synchronized or unsynchronized fashion 15      using the teachings of the present invention.

### *General System Configuration*

Figure 1 illustrates a block diagram of the present invention's production configuration to extract text and image files, to paginate the text files to produce Equivalent Files, and to index the Equivalent Files. The 20      process begins with the PTO magnetic tapes 1 that are of type 3480 from the PTO. There are three different categories of PTO magnetic tapes: PTO text tapes, PTO image tapes and PTO assignment tapes. A UNIX machine 2 reads the data in the PTO tapes 1 into a large file buffer. The data is then parsed 25      to find each of the documents that are on the tapes. Parsing creates a table which contains patent numbers, the physical locations of the patent files on the tapes, the total number of bytes and other control information about each document that appears on the tape. A document can be either a patent, a certificate of correction, a reissued patent disclaimer or any other post-issuance document. The data can then be either stored in a digital linear tape (DLT)

3 or in any other suitable data storage medium. Because the amount of disk storage space required for the total active set of patents is greater than 1 terabyte (TB), currently the data is stored into libraries S. The libraries may contain PTO Text Files 6, PTO Image Files 7 and post issuance documents 9.

5 If a disk drive system with a large enough storage is available, the data can be stored in a disk drive. At present, the PTO image tapes are left in their original medium, namely the 3480 magnetic tapes.

Continuing to refer to Figure 1, when an order 10 requesting a list of 10 patents is entered into a UNIX database 11, the UNIX database 11 sorts the request list by patent location to minimize the number of different tapes that need to be mounted, and sends to the staging machine 8 the list of patents and other pertinent information such as the volume serial number of the tapes, and 15 location information that allows the staging machine 8 to fast forward to the individual patent files that are requested. The staging machine 8 creates a file on its disks of all the text and image portions of each patent that has been requested to process. When the staging machine 8 has the text and image files available, it sends the text and image files to the pagination machine 13.

Further referring to Figure 1, at present, the pagination machine 13 20 utilizes one or more DOS based machines 16 to paginate the text and image files and to create Equivalent Files as described more fully in the Terminology and Definition section in this Specification. After pagination, an index machine 19 adds post issuance documents 9 and indexes the Equivalent Files. The index machine 19 incorporates one or more DOS based machines 20. Next, the manufacturing machine 23 creates a CD ROM image of the 25 Equivalent Files and the Image Files and writes the image to a CD ROM and digital linear tapes 28. The manufacturing machine 23 may utilize one or more DOS based machines 27, a CD ROM writer 25 and digital linear tapes 28. The CD ROM with the Equivalent Files and the Image Files are delivered to a user who then uses a system, such as the one illustrated in Figure 3, to 30 display and manipulate the files. The digital linear tapes with the finished patents are stored in a library 30, and the database 11 is updated so that when

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a particular patent in the library 30 is requested, the staging machine 8 mounts the finished patent from the library 30, and the database flags that the patent has already been paginated and indexed, so that pagination and indexing steps can be skipped for a faster process. Although in the present invention, specific machines such as UNIX machines and DOS machines are disclosed, these are mere examples of different types of computer systems that can be incorporated and not limitations upon the present invention.

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As evident from the above description, the present invention involves a significant amount of transfer of data between machines, such as between the extraction machine, the libraries 5, the staging machine 8, and the pagination machine 13 (in practice, these machines may be implemented using a single computer platform, or multiple computer platforms). The manner in which such data transfer takes place according to a preferred embodiment of the present invention shall now be described with reference to Figures 73 and 74.

15

Figure 73 is a simplified representation (in block diagram form) of the system configuration shown in Figure 1. Figure 73 shows a computer system 7302 that includes a first client machine 7304, a second client machine 7306, a shared disk drive 7310, and a tape drive 7308. The shared disk drive 7310 is preferably part of the second client machine 7306, and the second client machine 7306 is preferably a UNIX-based machine. Preferably, the shared disk drive 7310 can be directly accessed by both the second client 7306 and the first client 7304.

20

As will be appreciated, in UNIX-based systems, file rename operations are atomic operations. Thus, the shared disk drive 7310 cannot perform any other file-related operations when it is performing a file rename operation (this is the case, since the shared disk drive 7310 is part of the UNIX-based second client machine 7306).

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There are instances when the first client 7304 will want to access data in the tape drive 7308 via the second client 7306. Consider the case where the first client 7304 represents the pagination machine 13, the second client 7306 represents the staging machine 8, and the tape drive 7308 represents the

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library 5. Often, the pagination machine 13 will want to access data in the library 5. To do so, the pagination machine 13 will have to interact with the staging machine 8. Preferably, such interaction between the pagination machine 13 and the staging machine 8 is achieved by using the shared disk drive 7310. In particular, the pagination machine 13 (i.e., the first client 7304) writes a "read" command on the shared disk drive 7310. The staging machine 8 (the second client 7306) retrieves the "read" command from the shared disk drive 7310 and then performs the "read" command, wherein such performance of the "read" command results in data being read from the library 5 (tape drive 7308) and transferred to the pagination machine 13. Other data transfer scenarios in the system configuration shown in Figure 1 will be apparent to persons skilled in the relevant art.

As will be appreciated, handshaking must be implemented between the first client 7304 and the second client 7306 to ensure that the second client 7306 does not read the "read" command from the shared disk drive 7310 before the first client 7304 has finished writing the "read" command to the shared disk drive 7310. Otherwise, improper operation will result.

Figure 74 is a flowchart 7402 representing the operation of the first client 7304 and the second client 7306 during data transfer operations. Such operation of the present invention achieves handshaking during data transfer operations without requiring any explicit communication between the first and second clients 7304, 7306. This helps in reducing the load on system resources (such as communication bandwidth), thereby optimizing system performance. Flowchart 7402 begins with step 7404, where control immediately passes to step 7406.

In step 7406, the first client 7304 begins writing a read command file (which contains commands that instructs the second client 7306 to read data from the tape drive 7308) to the shared disk drive 7310. The read command file is named "DLT.CXX". The second client 7306 periodically scans through the shared disk drive 7310 and retrieves and executes files with a ".CMD" extension.

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Step 7408 is performed after the first client 7304 has completely written the file "DLT.CXX" to the shared disk drive 7310. In step 7408, the first client 7304 changes the name of the "DLT.CXX" file to "DLT.CMD". As discussed above, file rename operations are atomic operations. Thus, the 5 second client 7306 is not able to read the "DLT.CMD" file from the shared disk drive 7310 until the rename operation is complete (and the rename operation is not initiated until the read command file has been completely written to the shared disk drive 7310).

In step 7410, after the rename operation is complete, the second client 10 7306 discovers that a file with a ".CMD" extension is located in the shared disk drive 7310 (i.e., the "DLT.CMD" file). The second client 7306 retrieves the "DLT.CMD" file from the shared disk drive 7310, and executes it. Operation of flowchart 7402 is complete after step 7410 is performed, as indicated by step 7412.

15 Referring now to Figure 3, an exemplary computer display system for use in accordance with the teachings of the present invention is shown. The computer system includes a display 40, such as a CRT monitor or a liquid crystal display (LCD), and further includes a cursor control device 42, such as a mouse of the type shown in U.S. Patent No. Re.32,632, a track ball, joy 20 stick, keyboard or other device for selectively positioning a cursor 44 on a display screen 68 of the display 40. Typically, the cursor control device 42 includes a signal generation means, such as a switch 46 having a first position and a second position. For example, the mouse shown and described in U.S. Patent No. Re.32,632 includes a switch which the user of the computer system 25 uses to generate signals directing the computer to execute certain commands. As illustrated, the cursor control means 42 (hereinafter all types of applicable cursor control devices, such as mice, track balls, joy sticks, graphic tablets, keyboard inputs, and the like, are at times collectively referred to as the "mouse 42") is coupled to a computer 48.

30 The computer 48 comprises three major components. The first of these is an input/output (I/O) circuit 50 which is used to communicate information

in appropriately structured form to and from other portions of the computer 48. In addition, the computer 48 includes a central processing unit (CPU) 52 coupled to the I/O circuit 50 and a memory 55. These elements are those typically found in most general purpose computers, and in fact, computer 48 is intended to be representative of a broad category of data processing devices capable of generating graphic displays.

Also shown in Figure 3 is a keyboard 56 to input data and commands into the computer 48, as is well known in the art. A mass memory disk 60 is shown coupled to I/O circuit 50 to provide additional storage capability for the computer 48. In addition, a CD ROM 62 and a floppy disk 64 is further coupled to the I/O circuit 50, for providing, as will be described, a library of textual documents and images to be displayed on the display 40. It will be appreciated that additional devices may be coupled to the computer 48 for storing data, such as magnetic tape drives, as well as networks, which are in turn coupled to other data processing systems. A printer 57 is coupled to the I/O circuit 50 for printing documents, images, and the like, as is well known.

In one embodiment, the present invention is a computer program product (such as a floppy disk, compact disk, etc.) comprising a computer readable media having control logic recorded thereon. The control logic, when loaded into memory 55 and executed by the CPU 52, enables the CPU 52 to perform the operations described herein. Accordingly, such control logic represents a controller, since it controls the CPU 52 during execution.

As illustrated in Figure 3, the display 40 includes the display screen 68 in which a window 70 is displayed. The window 70 may be in the form of a rectangle or other well known shape, and may include a menu bar 72 disposed horizontally across the length of the window, or in any other desired position on the window. As is well known, the movement of the mouse 42 may be translated by the computer 48 into movement of the cursor 44 on the display screen 70. The reader is referred to literature cited in the background describing object-oriented display systems generally, and in particular, desktop metaphor window-based systems for additional description related to other

computer systems which may be utilized in accordance with the teachings of the present invention. The system illustrated in Figure 3 is intended to represent a general computer display system capable of providing a graphic user interface display.

5 In this specification, the present invention is described with reference to the display, navigation, and manipulation of United States patent documents. In particular, the invention is described herein as providing a unique method and apparatus for extracting, paginating, displaying, manipulating, navigating and editing the text of issued United States patents, and simultaneously displaying an image of a patent including the drawings on the display 40. 10 Although the description herein describes the invention with reference to patent documents, as has previously been mentioned, it will be appreciated by one skilled in the art that the present invention may be used in a variety of applications which require the simultaneous display, synchronization of, or 15 unsynchronized display of, text and images on a display. For purposes of this specification, all references to "patents" or documents generally, shall be understood to encompass documents of every type, and are not limited solely to patent documents.

20 In addition, it will be noted that no particular programming language has been disclosed to implement the present invention using the computer display system illustrated in Figure 3. A variety of programming languages such as C, C++, Visual Basic, etc. may be used to implement the present invention on many different computer display platforms, using the teachings described herein.

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### *Terminology And Definitions*

A "PTO Image File" is an electronically stored data file in the format specified in the document: "U.S. Patent and Trademark Office APS U.S. Patent Image Data File". Each of these files contains one or more image pages from a patent document. Each image page in a PTO Image File is an

5 electronic representation of an actual page of a patent or a related patent document (such as a Certificate of Correction). The image pages are created by the U.S. Patent and Trademark Office by the use of an electronic scanner, and are stored in the PTO Image File in Group 4 compressed format (see Federal Information Processing Standards publication 150: "Facsimile Coding Schemes and Coding Control Functions For Group 4 Facsimile Apparatus"). An enlarged portion of an exemplary image page (the bibliography page of patent 5,165,027) is shown in Figure 4.

10 A "PTO Text File" is an electronically stored data file in the format specified in the document: "U.S. Patent and Trademark Office Patent Full-Text/APS File". Each of these files contains an ASCII text representation of most of the textual data in a patent document. Generally, the bibliography information and the text paragraphs in the main body of the patent will be found in this file. Some equations and tables of textual information that 15 appear in a patent will also be stored in this type of file. Visual information, such as diagrams and tables containing information of a graphical nature, and formatting information will not be found in the PTO Text File. In addition, the column and line number information that appears on published patents is not stored in the PTO Text File nor is the format of the bibliographical page.

20 The ASCII data in a PTO Text File is stored in fixed-length eighty character records. The first four characters of each record are an ID code that identifies what type of data the record contains, the fifth character is a blank, and the last seventy-five characters of the record store the actual data values. If the first four characters are all blanks, then the record is a continuation of 25 the previous record.

26 For example, in the PTO Text File for patent 5,165,027 (part of which is illustrated in Figure 5), there is a record that begins with "TTL" followed by "Microprocessor breakpoint apparatus". This "TTL" record stores the title of the patent which is "Microprocessor breakpoint apparatus". One of these 30 "TTL" records is required in every patent.

Another record, which begins with "ISD" and contains "19921117", shows the issue date of the patent which is November 17, 1992.

In both of the above examples, the amount of data to be stored is seventy-five characters or less and therefore fits in one record. In many instances, there is too much data to fit in one record. Paragraphs of text from the main body of the patent are often split into multiple records because they have more than seventy-five characters. The first record of such a paragraph would start with an identifier ("ID") such as "PAR" (which indicates a paragraph whose first line is indented). The subsequent records used to hold the paragraph would start with an ID of four blanks indicating that these records are continuations of the first record. As many words as will fit in the seventy-five characters (without breaking the words) are stored in each record (see Figure 5).

The PTO Text File stores data relating to a patent in an informational format using ASCII text rather than a visual display format (see Figure 5). The Text File is comprised of records that contain labeled pieces of information. This is a very convenient format for processing the information about a patent using a computer (such as performing a text search or navigating the text of the patent).

The PTO Image File stores data relating to a patent in a scanned bitmap display format that is very easy for a human being to work with (see Figure 4) since it visually appears as the original published patent. The PTO Image File comprises a series of digitized page images that are created by using a page scanning device to capture black and white pictures of typeset patent pages. This is a very convenient format for allowing a human to view the information contained in a patent. For example, the image pages can be printed on a laser printer to produce a readable paper document that visually displays the diagrams, equations and figures of the patent, as it was published by the U.S. Government.

An "Equivalent File" is an electronically stored data file which contains pagination information that details the equivalence relationship between a PTO

Text file and a PTO Image File. This relationship makes both the PTO Text file and the PTO Image File more useful by specifying how the record-based ASCII data of the PTO Text file can be manipulated to be substantially equivalent in appearance to the PTO Image File and yet still retain its useful properties as an ASCII file.

5 "Pagination" is a process by which an Equivalent File is created from a PTO Text File and a PTO Image File. The PTO Image File is read to determine the locations of column breaks, column number, line breaks and line numbers as well as the locations and sizes of imbedded tables, structures, 10 equations, and other non-text information in the specification. Pattern recognition techniques familiar to those skilled in the art are used to block and segment the layout of the image pages.

15 The PTO Text File is read to determine bibliographic information, figure references, section headings, font style, point size, superscript, subscript, boldness or presence of italicized type, and special characters.

20 The results of these two operations are then combined either manually, or by the use of Optical Character Recognition techniques to produce the equivalent File. Each of the PTO Text File paragraphs that begins with a bibliographic information ID code is formatted to approximate the appearance of the Bibliography section on a typeset PTO Bibliography Image Page. Likewise each of the text paragraphs from the PTO Text File in the Specification and Claims sections is processed to produce a text file formatted 25 to approximate the appearance of the Specification or Claims section in typeset PTO Specification and Claims image page(s).

25 The requirement for pagination of the PTO Text File and the PTO Image File arises from several distinct requirements in the field of use. In citing a patent in, for example, a legal proceeding, the specific reference is made by the column number and line number of the portion of interest. These column and line numbers are printed in the published patent and appear in the 30 format of the page represented by the PTO Image File. However, these column and line numbers do not appear in the PTO Text File, making it

difficult to discern a proper citation from the PTO Text File. In use, a user may perform a word search on the PTO Text File to locate a specific term. Once located in the PTO Text File, should the user wish to cite that reference, he or she must refer back to the PTO Image File (or the actual paper patent) to locate the exact column number and line number, without the benefit of any information as to that location.

Another requirement for pagination arises from the practice of placing pure images in line with the text in the columns of the patent. For example, a diagram of a structure followed by the text description of that structure, in the PTO Text File would appear only as text, without the image of the structure. The user must refer back to the PTO Image File (or the paper patent) to locate and study the diagram of the structure, again without any information regarding the physical location of the illustration, diagram, figures or the like, from the data in the PTO Text File.

The specific information about how the typesetting equipment processes the data from the PTO Text File to produce the PTO Image File is not available from the U.S. Government. Therefore, the two files must normally be treated as completely separate entities. (The PTO itself uses the files separately on two computers manufactured by Sun Microsystems, Inc..) The PTO Text File is normally used to search for text but has no information as to where or how the information appears in the typeset patent image pages. The PTO Image File is used to view the typeset text, diagrams, figures, and equations but has no representation of the data stored in a format that can be searched by a computer.

The purpose of the Equivalent File of the present invention is to paginate the PTO Text File so that the data in the Text file can be presented in a paginated patent-like format, thus facilitating searching in, and direct citation from the text, a function heretofore not available using the PTO Text Files. The pagination process formats the PTO Text File with correct column breaks, column numbers, end of line breaks, and line numbers, thus allowing direct citation, along with the benefits of pure text searching. The information

contained in the Equivalent File can be used in both a familiar visual format by a human being and automatically by the computer at the same time.

A "synchronized" display is a method of navigating an Equivalent File and the corresponding Image File in a way that a user can view a column in the Equivalent file and the same column in the Image File simultaneously. For example, when the user views column 3 of the Equivalent File in a window, he can simultaneously view column 3 of the Image File in another window. Thus, the user can view two files, an Equivalent File and an Image File, in a synchronized manner.

An "unsynchronized" display is a method of displaying one portion of an Equivalent File and another portion of an Image File asynchronously. For example, assume there is a sentence in column 2 of the Equivalent File stating "referring to Figure 5, the system illustrates . . ." If a user selects the sentence in the Equivalent File, the Image File will display the first page which contains Figure 5. Thus, the Equivalent File and the Image File do not refer to the same column, but they refer to the related matters. Another example of an unsynchronized display is displaying one portion of the Equivalent File while displaying a completely unrelated drawing, an unrelated table, or a different text portion of the Image File of the same patent or an Image File of another patent. Accordingly, in an unsynchronized display, there may be no relationship or linkage between the Equivalent File and the Image File displayed simultaneously.

The underlying structure of the information stored in the Equivalent File may be stored in many forms. It may be stored in a binary structure format for fast access by a language that implements structure operations such as the C programming language. Another alternative is to store some of the underlying structural information about the text in a generalized markup language such as SGML (Standardized Generalized Markup Language) and store the raw positional information in a binary structure format. There are many alternatives having their own impact on capabilities, speed, and ease-of-use of the present invention. The reader may therefore implement the present

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invention in the particular programming language which best accommodates the reader's system requirements. As previously described, the present invention may be implemented using a variety of computer systems, including the system shown in Figure 3.

5        The SGML may be used in a variety of applications. The SGML may be used to write a patent application that is equivalent in appearance to a published patent. The SGML may be also utilized to create a compound document that contains both the Equivalent File and bit scanned images of tables, flow charts, equations and the like.

10      Equivalent Files are associated with at least the following types of synchronization information:

1.      *Column*

15      The positions within the PTO Text File of the first character of each patent text column as those columns are displayed in the PTO Image File. This permits the present invention to determine which ASCII text is displayed in each column of the main body of the patent.

2.      *Line*

20      The positions within the PTO Text File of the first character of each line of text as those lines are displayed in the PTO Image File. This permits the present invention to determine which ASCII text is displayed in each line of each column of the main body of the patent.

25      *Column Line Number*

      The approximate line number in the patent column that each line of text in the PTO Text File is adjacent to, permitting the present invention to determine the approximate vertical positions of the ASCII text lines displayed in each column of the main body of the patent.

30      *Bibliographic formatting*

      The approximate arrangement of the bibliographic data from the PTO Text File as it appears on the bibliographic page images in the PTO Image File.

5. ***Graphic Item Locations***

The locations in the PTO Image File of the various figures, figure elements, equations, non-text tables, structures and diagrams referred to in the PTO Text File.

5  
6. ***Sections***

The positions within the PTO Text File of the various logical sections of the document (e.g., background of the invention, brief description of the drawings, the claims section, etc.) as they are displayed in the PTO Image File.

10  
7. ***Font***

The font style in which the various ASCII characters in the PTO Text File are displayed in the PTO Image File.

8. ***Point Size***

The font size in which the various ASCII characters in the PTO Text File are displayed in the PTO Image File.

15  
9. ***Superscript or Subscript***

Whether the various ASCII characters in the PTO Text File are displayed as superscripts or subscripts in the PTO Image File.

10. ***Boldness***

20  
The degree of boldness of the font style in which the various ASCII characters in the PTO Text File are displayed in the PTO Image File.

11. ***Italics***

25  
The degree of italicness of the font style in which the various ASCII characters in the PTO Text File are displayed in the PTO Image File.

12. ***Special Characters***

30  
Some of the ASCII characters in the PTO Text File are displayed in the PTO Image File as special characters. Typically a group of characters in the PTO Text File (e.g., ".OMEGA.") will map to one special character in the PTO Image File (e.g., "Ω"). This is

due to the ASCII standard not defining many special characters that are useful.

As an example of the "Column" information listed above, refer to the paragraph of text from the main body of patent 5,165,027 that begins with  
5 "Numerous techniques are used...". Figure 6 shows how the ASCII characters for this paragraph are stored in the PTO Text File. The same paragraph is displayed in the PTO Image File for patent 5,175,027 in Figure 7.

It should be noted that the paragraph in the PTO Text File (see Figure 6) is 5 lines long, and that the same paragraph displayed in the PTO Image File (see Figure 7) is 7 lines long. In addition, no words are broken across lines in the PTO Text File. Words at the ends of lines displayed in the PTO Image File may be split so that part of the word appears at the end of one line, followed by a hyphen, and the rest of the word appears on the next line (e.g., "perf-or-mance").

10 The Equivalent File is associated with line numbers to identify which of the ASCII characters in the PTO Text File fall in which lines displayed in the PTO Image File. For example, the Equivalent File would store the lines of the paragraph in the PTO Image File (see Figure 7) beginning with the following characters in the PTO Text File:

15 Line 1: The "N" in "Numerous".

Line 2: The "m" in the middle of "performance".

Line 3: The "d" in "development".

Line 4: The "T" in "The".

Line 5: The "p" in "part".

20 Line 6: The "s" in "some".

Line 7: The "t" in "that".

25 As an example of the "Column" information listed above, refer to the first page image of the specification of U.S. Patent 5,165,027, shown in Figure 8. As illustrated, the first column of the patent begins with the "M" in "MICROPROCESSOR". The second column of the patent begins with the "d" in "data". These positions are stored in the Equivalent File in order to

identify which of the ASCII data in the PTO Text File falls within which columns.

Figure 8 also shows an example of the "Column Line Number" information listed above. The column of numbers that runs down the middle of the page indicate what line numbers within the patent text columns each of the lines of text falls on. For column 1, shown in Figure 8, the line that contains "This application is a continuation of application Ser." is line 4 of the column. In column 2, shown in Figure 8, the line that shows "address at which a breakpoint is to occur. A second" is line 8 of the column. This information is associated with the Equivalent File to identify the approximate vertical position on the page image where a given line of text appears.

As an example of "Bibliographic formatting" information, reference is made to Figures 4 and 5. Notice that the title record which starts with "TTL" has its data displayed in bold below the words "United States Patent", the inventor's name, and a horizontal ruler line. Each piece of bibliographic information is stored as a column of text in the Equivalent File.

Paginating the bibliography data from the PTO Text File to the formatting on the bibliography pages in the PTO Image Files also involves adding text labels to the Equivalent File. For example, the characters "United States Patent [19]" that appear at the top of every bibliography page are not found anywhere in the PTO Text File. These words appear at the top of every patent so their presence in the PTO Image File is unnecessary. However, in order to create an Equivalent File that is similar in appearance to the PTO Image File, these words must be specified in the Equivalent File. The pagination algorithm is designed to add these text labels when they are needed.

### *Extraction*

The extraction process of the present invention is illustrated in block diagram form in Figure 9. The PTO provides the PTO Text File and PTO Image Files on IBM® 3480 magnetic tapes. The extraction process identifies

the particular IBM® 3480 tape that a specific PTO Text File or a PTO Image File is located in, extracts those files from the tape(s) and converts them for use by the processing system which synchronizes and indexes the files.

PTO Text Tapes are issued by the PTO on specific calendar dates and contain a unique Volume Serial Number (VSN). All patents issued on a certain date should be present in the tape(s) issued on that date. The tapes do not contain an index. Therefore, extracting a specific PTO Text File requires that the entire 200 MB IBM® 3480 tape be read into a magnetic disk buffer and stripped of header blocks, tape marks labels, etc., and then parsed to create a Volume Table of Contents (VTOC). The VTOC contains the document number, byte count offset from the beginning of the tape, and the length of the document file in bytes. A separate program may then be used to index the beginning byte of the file and copy the file segment to another file, which then becomes the PTO Text File for the specific patent. It is possible for a PTO Text File to span multiple PTO Text Tapes. When this happens, a procedure is utilized by the present invention to concatenate the multiple file segments together. The VTOC created from the magnetic disk buffer is used to update a Relational Database System (RDB) for future reference, and the buffer is then erased.

PTO Text Files are stored on the magnetic tapes in uncompressed format. PTO Image Files are stored on the magnetic tapes preferably in compressed format, preferably in Group 4 2D (two dimensional) fax format. According to the present invention, PTO Text files are processed in uncompressed format. However, PTO Image files are processed at least in part in compressed format. The processing of Image Files according to the present invention is generally depicted in Figure 75.

An example 2D compressed Image is shown in Figure 75 as block 7506. According to the present invention, the 2D compressed Image 7506 is converted to a 1D compressed Image 7508. Many functions performed by the present invention involve processing this 1D compressed Image 7508. (With some operations, such as with zooming and with pagination, the 1D

compressed image 7508 is decompressed to an uncompressed format, as represented by item 7510 in Figure 75. Typically, this uncompressed Image file contains 2320 bits by 3408 bits. Zooming and pagination is discussed below.) In contrast, conventionally such functions are performed by solely processing uncompressed images.

The structure of a 1D compressed Image shall now be described with reference to Figures 76A and 76B. Figure 76A illustrates a representation of an example uncompressed Image 7602. A typical line 7604 in this uncompressed Image 7602 is shown. This line 7604 includes a number of black spaces (each black space representing a logical 1 bit) and a number of white spaces (each white space representing a logical 0 bit).

A 1D compressed Image 7606 corresponding to the uncompressed Image 7602 is shown in Figure 76B. This 1D compressed Image 7606 includes a line 7608 (called the compressed line 7608) corresponding to the line 7604 (called the uncompressed line 7604) in the uncompressed Image 7602. The compressed line 7608 represents the uncompressed line 7604 by quantifying the number of black and white spaces in the uncompressed line 7604, while preserving the sequence of such black and white spaces. Thus, as indicated in the compressed line 7608, the uncompressed line 7604 contains 128 black spaces, followed by 64 white spaces, followed by 8 black spaces, followed by 64 white spaces, followed by 102 black spaces, followed by 90 white spaces.

Procedures for converting between uncompressed Images, 2D compressed Images, and 1D compressed Images will be apparent to persons skilled in the relevant art. Such procedures are discussed in many publicly available documents, such as Federal Information Processing Standards Publication No. 150, entitled "Facsimile Coding Schemes and Coding Control Functions for Group 4 Facsimile Apparatus," November 4, 1988, incorporated herein by reference in its entirety.

*Initial Automatic Pagination*

The initial automatic pagination process is illustrated in flow chart form in Figure 10. The automatic pagination process utilizes the PTO Text File and creates an Equivalent File that is an initial approximation of the formatting of  
5 the original published patent.

The steps of initial pagination of the present invention are as follows:

1. Read the PTO Text File into memory of a computer system (for example, a computer system of the type shown in Figure 2 may be utilized).
- 10 2. Assign each of the ASCII data records that begins with a bibliographic information ID code, an approximate location on the corresponding image page of the PTO Image File at which its data should be displayed. See the document "U.S. Patent and Trademark Office Patent Full-Text/APS File" for a listing of all the bibliographic data record ID codes. Also, see the document "Patents and Trademarks Style Manual" for a specification of how bibliography information is formatted on bibliography pages.
- 15 3. Process each of the paragraphs of the main body of the patent. Build a list of the locations of the Logical Groups that are found (see the document "U.S. Patent and Trademark Office Patent Full-Text/APS File" for a listing of the Logical Groups that can appear in the main body of the patent, i.e. "GOVT", "PARN", "BSUM", "DRWD", "DETD", "CLMS", "DCLM").
- 20 4. Save the pagination information to disk in an Equivalent File.

In steps 2 and 3 above, the paragraph formatting procedure is performed whenever there is a data value that might span more than one line

in the corresponding page image in the PTO Image File. In addition, the autopagination technique may be utilized on compressed data.

The manner in which the autopagination technique may be utilized on compressed data shall now be described. As discussed above, the present invention generates a 1D compressed image file from the uncompressed image file provided by the PTO. According to an embodiment of the present invention, pagination is performed using the uncompressed PTO text file and the 1D compressed image file. This embodiment is described below with reference to a flowchart 7802 shown in Figure 78. Flowchart 7802 begins with step 7804, where control immediately passes to step 7806.

In step 7806, clumps are identified in the 1D compressed image file. A clump is a group of dark spaces (each "dark space" representing a logical "1" value) that are adjacent to one another either vertically (between lines) and/or horizontally (within lines) and/or diagonally. In an alternate embodiment, a clump can represent a group of white spaces. The operation performed in step 7806 is called "segmentation". Conventionally, segmentation is not performed using compressed data images. Instead, segmentation is conventionally performed using uncompressed data images. According to such conventional procedures, it is necessary to search an uncompressed data image in the vertical, horizontal, and diagonal directions. However, since the present invention uses 1D compressed images, it is only necessary to search in the vertical and diagonal directions (this is assuming that clumping is done vertically, horizontally, and diagonally; if clumping is only done horizontally and vertically, then the present invention searches only vertically). This is the case since 1D compressed images are already clumped in the horizontal direction (this is apparent from Figure 76B). Thus, the use of the present invention of 1D compressed images significantly decreases the processing time to perform segmentation.

Preferably, the present invention in step 7806 searches for dark spaces in adjacent rows which vertically overlap. Consider an example 1D compressed image 8502 shown in Figure 85A, where two rows 8504 and 8506

are shown. Row 8504 has 2 dark spaces, followed by 3 white spaces, followed by 2 dark spaces, followed by 1 white space. Row 8506 has 3 dark spaces, followed by 1 white space, followed by 2 dark spaces, followed by 2 white spaces. The present invention generates a table 8508 shown in Figure 5 85B from rows 8504 and 8506. Table 8508 contains information that denotes the boundaries between groups of white and dark spaces in rows 8504 and 8506. Table 8508 contains an entry for each row in the compressed image 8502, such as entries 8510 and 8512 that correspond to rows 8504 and 8506, respectively. Entry 8510 is derived by adding each value in row 8504 with 10 the preceding value or sum. Thus, the "5" in entry 8510 is derived by adding "3" plus "2" from row 8504. The "7" in entry 8510 is derived by adding "2" from row 8504 plus "5" (i.e., The prior sum). Each entry in table 8508 is 15 generated in the same way.

Once table 8508 is generated, clumps are identified by analyzing the 20 dark space boundary information contained in entries 8510 and 8512. For example, the dark space boundary information contained in entry 8510 indicates that row 8504 has dark spaces in bit positions 1-2 and 5-7. The dark space boundary information contained in entry 8512 indicates that row 8506 has dark spaces in bit positions 1-3 and 4-6. Bit positions 1-2 vertically overlap bit positions 1-3. Thus, these dark spaces in rows 8504 and 8506 25 represent at least a part of a clump. Also, bit positions 5-7 vertically overlap bit positions 4-6. Thus, these dark spaces in rows 8504 and 8506 represent at least a part of another clump. This analysis is performed for all of the entries in the table 8508. Note that it was possible to identify these clumps based on the dark space boundary information contained in table 8508.

Each of the clumps identified in step 7806 may represent a character. 30 In step 7808, the clumps are compared to character templates. The character templates are bit patterns corresponding to characters, such as alphanumeric characters, punctuation characters, graphical characters, etc. Thus, in step 7808, the clumps are compared to character templates for the purpose of recognizing the clumps as characters.

The operation performed in step 7808 is called "template matching." Preferably, template matching is performed by finding the center of gravity of the clump being processed (each clump is processed, i.e., matched, in turn) and the center of gravity of each template (the centers of gravities of the templates are preferably calculated in advance). The center of gravity is defined as the (x,y) location where the x coordinate in this (x,y) location is equal to the average of all of the x coordinates in the dark spaces of the clump, (the terms "spaces" and "pixels" are used interchangeably herein) and the y coordinate in this (x,y) location is equal to the average of all of the y coordinates in the dark spaces of the clump. Then, the clump is aligned with a template (each template is processed in turn) such that the center of gravities of the clump and the template coincide. The number of pixels in the template and the clump having the same value is then determined. Consider, for example, the pixels at the center of gravity of the clump and the template. If they are both equal to 1, or are both equal to 0, then the sum is incremented by 1. Otherwise, the sum is not incremented. This comparison operation is performed for each pixel in the clump and the template. Then, the sum is divided by the total number of pixels in the smallest rectangle enclosing both the clump and the template. If this resulting quotient (also called score) is above a predetermined threshold, then the clump is said to match the template and is recognized as that character represented by the template. Preferably, this predetermined threshold is approximately 90%, although other values could alternatively be used, and could vary from template to template. The above analysis is performed for each template until the clump is recognized.

It should be noted that not all clumps are recognized.

In one embodiment, the character templates have been previously compressed such that they are 1D compressed character templates. Such 1D compressed character templates are compared to the clumps in step 7808. Alternatively, the character templates are not compressed. Instead, the clumps are decompressed, and are then compared to the uncompressed character templates in step 7808.

In step 7809, page parsing is performed. With respect to patent documents, the present invention first locates column numbers (appearing at the top of columns in patents) in the processed image file. This is done by looking for clumps which have been recognized in the previous step as large-sized numbers in the processed image file. Then, the present invention locates the patent number which appears in large-sized numbers at the top of each page in a patent. As will be appreciated, PTO Image files include a series of line numbers (i.e., 5, 10, 15, 20, etc.) between the left and right columns on each page of text. The present invention searches for these line number sequences to identify these columns. The present invention uses this information to identify which clumps are in which columns. These clumps are assigned sequential position numbers, preferably starting from 1. Similarly, the characters in the PTO text file are assigned sequential position numbers, preferably starting from 1. As described below, these position numbers are used to compare the processed image file with the PTO text file for matching purposes.

In step 7810, lines of characters (such characters having been recognized in step 7808) are identified. Step 7810 may be performed using any well known line recognition technique. One such line recognition technique operates by processing each character in turn. If the center of a character is between the top and bottom of the previous character, then the two characters are considered to be in the same line. For reference purposes, the lines of characters recognized by the above-described operations are called the processed image file.

In step 7812, the present invention matches the PTO text file to the processed image file. The purpose of this matching operation is to identify the ends of lines, columns, and pages in the processed image file, and to then reflect such ends of lines, columns, and pages in the PTO text file to thereby generate the Equivalent File. The Equivalent File is synchronized to the Image File on a line/column/page basis.

For example, suppose the PTO text file includes the following sentence: "The present invention includes a computer platform." In step 7812, the present invention matches each word in this sentence to words in the processed image file. Suppose that the word "computer" in this sentence is 5 presently being analyzed. The word "computer" from the PTO text file is matched with an identical word in the processed image file. If this word is at the end of a line in the processed image file, then the present invention reflects this end-of-line information in the Equivalent File. Similarly, if this word is at the end of a column or the end of a page in the processed image file, then 10 the present invention reflects this end-of-column/end-of-page information in the Equivalent File.

In one embodiment, Step 7812 is performed as follows. First, unique pairs of adjacent characters (not counting spaces) are identified in the PTO text file. These character pairs may include overlapping characters in words. 15 Second, a look up table having an entry for each character pair is created. The positions in the PTO text file where the character pairs are located are stored in the respective entries of the table. Third, unique pairs of adjacent characters (in the horizontal direction) in the processed image file are identified. These character pairs from the processed image file, which are 20 also called anchor pairs, may include overlapping characters in words.

Processing then continues to map the anchor pairs to the characters in the PTO text file. An anchor pair table is created having an entry for each anchor pair. These entries include the position information from the lookup table associated with the PTO text file for the anchor pairs. Then, positions 25 from this anchor pair table corresponding to impossible sequences of characters are eliminated.

For example, a portion of an example PTO text file 8608 is shown in Figure 86. A processed image file 8606 corresponding to this PTO text file 8608 is also shown. Only the clumps identified in step 7808 are shown in 30 Figure 86. The lookup table for the PTO text file 8608 is shown as item 8610. Item 8612 represents the anchor pair table before positional information

is deleted. Such positional information is deleted as follows. The first anchor pair, in this case "Th", is selected. The left-most position (in this case, the only position) of this anchor pair is position 1. The other anchor pairs are then evaluated with respect to this anchor pair "Th" to determine whether their 5 positions (in the PTO text file) can possibly correspond to the anchor pairs. First, the anchor pair "he" is evaluated. This anchor pair occurs at positions 2, 5, and 14 in the PTO text file 8608. The anchor pair at "he" can occur only at position 2 with respect to the anchor pair "Th", since it is known that "he" is in the same word as "Th" (this information is known since "Th" is 10 very close to "he" in the processed image file). Accordingly, positions 5, 14, and 25 are deleted. Searching is performed in both a forward and a backward direction. Consider the case where the anchor pair "ab" is selected. The anchor pair "th" can occur only at positions 4 and 13 with respect to anchor pair "ab", since anchor pair "ab" appears after anchor pair "th" in the 15 processed image file 8606 (at least with respect to the clumps identified in the processed image file 8606). Each anchor pair is selected, and then the other anchor pairs processed with respect to the selected anchor pair, in both a backward and forward direction. After as many of the positions from the anchor pair table 8612 have been deleted, it is possible to match the processed 20 image file 8606 to the PTO text file 8608 to identify end-of-lines in the PTO text file 8608.

Flowchart 7802 is complete after step 7812 is performed, as indicated by step 7814.

The automated pagination feature of the present invention as described 25 above results in an Equivalent File that is synchronized on a line, column, and page basis. In alternate embodiments, the text file is automatically paginated such that the Equivalent File is only synchronized on a page basis, a column basis, a line basis, or any combination of the above.

*Pagination Correction Tool*

The pagination correction tool allows a human to check and correct the results of the initial automatic pagination process. A computer system of the type illustrated in Figure 3 may also be used. This tool is a software program with a graphical user interface that provides the following capabilities, and completes the following steps:

- 5        · Open and read into memory a PTO Text File;
- 10      · Open and read into memory a previously edited Equivalent File on media;
- 15      · Use a cursor control device (for example, mouse 42) to mark or unmark characters that begin a patent column.
- 20      · Use a cursor control device (for example, mouse 42) to mark or unmark characters that begin lines within a patent column.
- 25      · Add or remove blank lines to set the appropriate vertical line spacing so that the lines of text fall on the same line numbers of the patent text column they are in as shown in the PTO Image File;
- 30      · Use a cursor control device to mark or unmark paragraphs as being section titles.
- 35      · Indicate which figures are on which drawing sheets.

As is typical in computer programs, the specified tasks listed above do not need to be performed in any particular order except that the file must be opened at the beginning and closed (and usually saved) at the end.

In an alternate embodiment, automatic pagination is not performed. Instead, pagination is entirely, manually performed by using the pagination correction tool. This embodiment is particularly useful when it is only necessary to synchronize on a page basis, or a column basis, for example. For reference purposes, such page basis synchronization, column basis synchronization, etc., are collectively called synchronization levels.

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In other embodiments, the operator is provided with an option of automatic pagination or manual pagination, or any combination of the two. This embodiment is represented by a flowchart 7702 shown in Figure 77. In step 7710, the operator may select automatic pagination or manual pagination. If the operator selects automatic pagination, then step 7712 is performed, wherein pagination is performed automatically, as discussed above. After step 7712 is performed, or if the operator did not select automatic pagination in step 7710, then step 7714 is performed. In step 7714, the operator uses the pagination correction tool to perform manual pagination.

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### *Indexing*

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A B+-tree inverted index of words is generated for a group of one or more Equivalent Files to greatly speed the process of searching the text of the files. These indexes are built from all the words in the PTO Text File. The index generator ignores end-of-line hyphens when building indexes but does not ignore hyphens in the middle of lines.

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The present invention utilizes the following build/search index technique: when indices are built, all punctuation marks in a text file are stripped, and the resulting alphanumeric words are entered individually into an index database. The word position in the text file is also stored. For example, a string such as "[Ax,Bx,Cx]" is converted to three separate words - "Ax", "Bx" and "Cx", and the individual words are entered into the index database as three separate items.

25

When a user enters a search string such as "[Ax,Bx,Cx]", the string is converted into the following tokens: "Ax", "Bx" and "Cx". The tokens are searched using the text conversion technique described above, and the resulting search produces three lists of search matches. These lists are processed and filtered for all occurrences. The occurrence of "Ax" is immediately followed by the occurrence of "Cx". This technique allows words originating from the

source text to be searched directly, without the need to store a large number of punctuation mark locations.

### *User Interface*

5        The graphic user interface of the present invention is comprised in part of a computer program which is stored in either mass memory 60, CD-ROM 62, or floppy disk 64, of the system illustrated in Figure 3. Appropriate programming code is loaded into memory 55 by the I/O circuit 50 and executed by the CPU 52. It will be appreciated that the computer program of the present invention may also be stored in random access memory (RAM),  
10        or in other machine readable form and media. The graphic user interface displays the Equivalent File and the PTO Image File, described above in previous sections, and provides a variety of viewing and editing options.

15        Referring now to Figure 11, the display screen 68 is shown in detail. Illustrated within the display 68, is a title bar 100 for identifying the title of the program in which the user interface of the present invention is utilized. In the example of Figure 11, the title of the program is PatentWorks Workbench™, however, depending on the nature of the program in which the present invention is used, the title may change in accordance with the particular application. In addition, a menu bar 102 is provided which includes  
20        a plurality of command options such as "Case", "Edit", "Patent", "Note", "Library", "View", "Window", and "Help". Additionally, other context specific command options may be displayed depending on the specific application in which the present invention is used.

25        As illustrated in Figure 11, a tool bar 103 is displayed immediately below the menu bar 102. The tool bar 103 comprises the primary source of options and selection items which a user of the present invention will commonly access. As will be described more fully below, the tool bar of the present invention includes a briefcase icon 106, a direction button 107 for dropping a list of available cases, a light bulb icon 108 for designating a patent

to a case, and a direction button 109 for obtaining a list of all patents or other documents which may be displayed in an Equivalent File format from a case. Additionally, a library icon 110 is provided on the tool bar 103, the selection of which provides a listing of all the patents available in the patent library.

5 A magnifying glass icon 112 is displayed for selecting a search box to appear on the display screen. A target icon 113 is provided for identifying search results. Other icons displayed along the menu bar 103 include a printer icon 115 for printing documents. A case note icon 125 for displaying case notes is also provided on the tool bar 103. A patent note icon 126 and a direction button 127 are also provided for reviewing and accessing patent notes.

10 The specific functions and operations of these various icons and command options displayed on the menu bar 102 and tool bar 103 will be described more fully below. It will be noted that all tool bar icons or button functions have keyboard equivalents designed to allow the user to perform the 15 functions of the icons and button functions without using the cursor control device. All of the functions of the tool bar 103 are also displayed in the menu bar drop down menus. Additionally, as shown in Figure 11, two instructional arrows 129 and 130 are displayed on screen 68. The instructional arrows 129 and 130 provide initial instruction to the user to begin work using the interface 20 of the present invention. These instructional arrows may be selectively turned on or off by the user. Moreover, as shown in Figure 11, in the lower left hand corner of the screen is a minimized image of the current library identified as the "Detkin" library.

25 Referring again to Figure 11 and Figure 3, in accordance with the teachings of the present invention, a user may access various functions by placing the cursor 44 over a command option on the menu bar 102 and signaling the CPU 52 using the mouse 42 or keyboard 56. A variety of methodologies may be employed for the selection of subcommand items illustrated in the various drop down menus once a command option on a menu 30 is selected. The present invention operates independently of the particular

methodology for function selection employed by the computer system illustrated in Figure 3.

As illustrated in Figure 12 and Figure 3, the placement of cursor 44 over the direction button 107, and the activation of button function 107 using either the mouse 42 or the keyboard 56, results in the display of a list 132. The list 132 lists all the cases in the system. In the example illustrated in Figure 12, there is currently one case which exists in the "System" library, and which is referred to as "demonstration". It will be appreciated that if the "System" library includes additional cases, then the names of these cases will be displayed in the list 132 as well. As illustrated in Figure 13, the selection of the case referred to as "demonstration" results in the display of the case name along the tool bar 103. Additionally, the instructional arrows of the present invention provide guidance to the user as to available options which may be selected in the current state of the user interface. For example, in Figure 13, instructional arrow 139 instructs the user to click on down arrow 109 to open and view the list of patents already disposed within the case "demonstration". Instructional arrow 140 informs the user that he may click on the library icon 110 to open the library and add patents to the case "demonstration". A case may contain patents from several libraries.

Referring now to Figure 14, assume for example that a user activates button function 109 which results in the display of patents within the case "demonstration". Assume further that the user has selected U.S. Patent 4,760,478 (hereinafter ... 478"). As shown in Figure 14, the computer system illustrated in Figure 3 displays the Equivalent File of the '478 Patent in an equivalent window 160. As previously described in the specification, the Equivalent File of the '478 Patent was generated in accordance with the teachings of the present invention, including the processes of extraction, synchronization, indexing and the like as hereinabove described. Additional features of the equivalent window 160, and its operation in conjunction with other functions of the present invention will be described in more detail below. Also shown in Figure 14, is a Patent Text Toolbox 162. A downward arrow

button function 165 has been activated in Figure 14 by a user, resulting in the display of a drop down list 170. As shown, the drop down list 170 includes a listing of the sections of the Patent '478 displayed in the equivalent window 160.

5 As will be described, a user may quickly navigate from section to section by selecting one of the various sections of Patent '478 displayed in list 170. For example, in Figure 14, the bibliography section has been selected. In response to the selection of the bibliography section by the user, the CPU 52, illustrated in Figure 2, displays the bibliography portion of the Equivalent 10 File in the equivalent window 160. A user may verify that the bibliography section is currently being displayed within the equivalent window 160, by observing a letter "B" (referred to by numeral 175) displayed along the right edge of the equivalent window 160. In the present example, the letter "B" indicates that the text displayed within the equivalent window 160 corresponds 15 to the bibliography section of the patent. Additional features and functions of the equivalent window 160 will be described more fully below.

As illustrated in Figure 15, the activation of the library menu on menu bar 102 results in the display of a library drop down menu 150. The menu 20 150 includes a variety of command items including "Open Library", "Search", "Case Cross Reference", and "Set Library Directories". For purposes of this specification, a description of the various functions of the present invention will be set forth below. However, it will be appreciated by one skilled in the art, that the operation of the present invention is dynamic, and that a particular order or sequence of events illustrated herein is only one of a variety of 25 possible sequences of images and operations which the present invention is capable of performing. Since the present invention comprises a graphic user interface which permits an operator to interact with the computer system illustrated in Figure 3, the particular sequences of operations and displays generated herein, are dependent upon the computer system illustrated in Figure 30 3 in cooperation with the human operator.

Referring now to Figure 16, assume for example that a user selects the function "Set Library Directories" from the library drop down menu 150 illustrated in Figure 15. In response to the selection of the Set Libraries Directories command, the CPU 52 in Figure 2 displays a Set Library Directories dialog box 175 as shown in Figure 16. The Set Library Directories dialog box 175 permits a user to define the directories that contain libraries, and the directory used when creating new libraries. The Set Library Directories dialog box 175 includes a variety of dialog box options. As shown in Figure 16, a directories window 180 displays current directories available to the user. A user may place cursor 44 in Figure 3 over a desired directory, and signal the computer to select the directory using the keyboard 56 or the mouse 42 in Figure 3. After the selection of a directory, the directory may be added to the path list using the add directory button function 185. By double clicking on a directory to open the directory, the directories contained in the selected directory are then listed below the selected directory within a window 180. Additionally, various drives may be selected such as the CD drive 62 (see Figure 3). An icon representation of the CD drive 62 is also displayed in the Set Library Directories dialog box 175. For example, in Figure 16 the CD drive 62 is represented by an icon 200. By clicking on an icon to select it, all directories contained on the selected drive are then listed in the directories list displayed in window 180. As illustrated, the currently selected directory is also identified within the Set Library Directories dialog box 175. The currently selected directory may be a directory selected from the directories list or path list. Once a user has selected a directory, the activation of the add directory button function 185 adds the directory to the list of directories containing libraries in the window 190. A button function Remove Directory 205 removes a selected directory from the path list. Once removed, the directory is no longer used in searches for available libraries. The Set Library Directories dialog box 175 also includes a Set as Default button function 210. The Set as Default button 210 sets the currently selected directory as the default directory. When setting directories for libraries, the

directory set as a default is the directory where new libraries are created. As illustrated in Figure 16, the Set Library Directories dialog box 175 also identifies the current default directory.

Referring now to Figure 17, selecting a New Library option from menu 150 in Figure 15, results in the display of a New Library dialog box 225. Using the keyboard 56 in Figure 3 or other input device, a user may then input a library name into an open field 230 for the new library, and create a new library using the inputted name.

The selection of the Open Library sub-command item from menu 150 in Figure 15 results in the computer 48 in Figure 3 generating and displaying an Open Library dialog box 235, illustrated in Figure 18. As shown in Figure 18, the Open Library dialog box 235 includes a field 237 which displays previously created libraries in reference to only those libraries found in directories specified in the window 190. Additionally, the libraries are identified by name, for example, an "aaa" library 240 and a "bbb" library 242, are illustrated within the field 237. A scroll bar (not shown) is provided to permit the user to scroll through the various libraries in the event there are more libraries than can be displayed within the field 237 at any one time. The particular mechanism for scrolling will not be disclosed herein, since the scrolling of textual windows is known in the art.

In the presently preferred embodiment, referring to Figure 18 and Figure 3, a library is selected by the user by placing the cursor 44 over a library icon 238, or the name of the library, and double clicking switch 46 on the cursor control device 42. Alternatively, by placing cursor 44 over the name of the library or icon 238 and clicking switch 46 a single time, the library is highlighted. The library may then be selected by placing the cursor 44 over the OK button 250 and clicking switch 46. As shown in Figure 18, once a library is selected (in the example of Figure 18, the library "bbb"), the computer 48 highlights the name of the library. As used in this specification, a "library" contains a collection of electronic patents, which includes the Equivalent File and PTO Image File of each listed patent.

Referring now to Figure 19, the selection of a library (in the present example, the "bbb" library) results in the computer 48 in Figure 3 generating and displaying a Library content dialog box 260. As shown, box 260 includes a field 262 in which all patents comprising the selected library are listed. In 5 the example illustrated in Figure 19, the "bbb" Library includes only four patents (U.S. Patent Nos. 4,760,478; 4,783,757; 5,073,969 and 5,165,027). Additionally, all patents disposed within a library are identified by a light bulb icon 265 as well as the patent number as shown in the figure. Additional 10 patent specific information may also be included such as inventor's name, assignee information, patent titles, etc. Box 260 further includes a patent library icon 270 to denote box 260 as comprising library patents, as opposed to case patents which will be described below. Box 260 further includes a variety of other button functions, such as a "remove" button 274 to remove a 15 patent from the library, a "create a new case" button 276 for creating a new case from within the library box 260, and an "add to" button 278 for adding patents to a case.

In addition, as illustrated in Figure 19, box 260 includes a "select all" 20 button function 284 to choose all patents in the library window 262 to add. A user may select a single patent to view, in which case, the computer displays the patent Equivalent File in the equivalent window 160 illustrated in Figure 14. The selection of an OK button 286 dismisses the window 260 and 25 executes the function which the user has selected.

As shown in Figure 20, the selection of Patent '478 by the user results 30 in that patent being highlighted on the display. Box 260 further includes a downward arrow button 290 to minimize box 260 into the library icon 270, as shown in Figure 21. To minimize box 260, cursor 44 of Figure 3 is placed over button 290, and the mouse 42 of Figure 3 is momentarily clicked. Computer 48 of Figure 3, sensing the momentary depressing of switch 46, minimizes the box 260 as shown in Figure 21 as the library icon 270 identified by the name of the library which has been minimized.

The selection of the Update Library sub-command item within menu 150 of Figure 15 results in the display of an Update Library dialog box 300 illustrated in Figure 22. It will be noted that the Update Library box 300 refers to the current library in use, namely the Intel® Library in the present example. As shown in Figure 22, the Intel® dialog box includes the name of the current library, the date of the update, as well as an OK button and a "cancel" button to cancel the box display. In the presently preferred embodiment, the Update Library sub-command may only be selected once a library has previously been selected.

Referring now to Figure 23, the selection and operation of the Search sub-command from the menu 150 of Figure 15, or from the search icon 112, will be described. Upon the selection of the Search sub-command item, the computer 48 in Figure 3 generates and displays a Search Library dialog box 302 with the option to search in the current patent, current library, or current case. In operation, once the location of the search has been selected (for example, to search the current library), the user has the option to input various search words in a search word field 304 within the box 302, which may include Boolean terms such as "AND", "OR", and other logical search terms, such as for example, proximity searches within five, ten or twenty five words of a selected word. Additionally, the user may recall previously saved searches (button function 309), view word lists from selected patents being searched (button function 306), and save the current search (button function 308), or exit the dialog box by depressing a cancel button function. A variety of logical Boolean terms are predefined as button functions such as AND, OR, as well as other common search expressions to assist the user in defining the search. As shown in Figure 23, box 302 includes a word list button function 306. The activation of the cancel button 307 results in the dismissal of box 302.

Continuing to refer to Figure 23, additional features of the Search dialog box 302 will be described. As previously discussed, the Search dialog box enables a user to conduct a search for a phrase or group of phrases

incorporating Boolean terms. The user may choose the current library, the current patent, or the current case from the menu option, as shown in Figure 23. To conduct a search of patent notes, the reader is referred to the "find" command from the notes menu bar, to be described more fully below.

5 Assume for example that a user desires to conduct a search. First, the user must select a desired scope of the search. The scope identifies how much information will be searched. The selection of the "current patent" in box 302 results in the currently active patent being searched. Upon completion of the search, all occurrences ("hits") of the search string will be highlighted in the

10 text of the Equivalent File displayed in the equivalent window 160 in Figure 28. The user may also search the current library by clicking on that option in box 302. If the current library is selected, the search will encompass the entire patent library currently open. Upon completion of the search, all

15 patents in the library found to contain the search string will be listed in the Search Results dialog box which will be described with reference to Figure 26.

If the user selected the "Current Case" by clicking on that option in box 302, the currently open case will be searched. Upon completion of the search, all

20 patents in the case found to contain a search string will be listed in the Search Results dialog box. It is also possible for the user, using the teachings of the present invention, to search for words containing sub-words or parts thereof.

25 By entering words or numbers to find in field 304 of the box 302, and activating a Search button function 305, the search is initiated for the inputted words and/or numbers. A complex string search may be conducted by combining words with Boolean terms such as AND, OR, or proximity

30 searches. As will be described, a user may also select a saved search or select words using a word list. A user may also select portions of text from the Equivalent Text File. A Clear button function 309 in the search library dialog box 302 enables the user to clear current search words which have been defined in the search window 304. The activation of the Clear button 309 results in the clearing of the entire contents of the window 304. Alternative methods for clearing are the use of a back space delete key from the keyboard

56 in Figure 3. In addition, words can be copied and pasted onto the field 304 of the box 302.

With regard to the Boolean expressions, as is well known, the "AND" term results in all occurrences of a word AND a word to be searched. For 5 example, searching the words "data AND device" will yield all occurrences of the term "data (and all occurrences of the word) device" throughout the entire search scope. For example, searching the string "data OR device" will yield all occurrences of either "data" or "device". An asterisk option signifies a wild card in the search term. This allows searching using incomplete words 10 or a word which may contain additional characters to the term being search. For example, searching "de\*" will find all the words in the search scope that begin with "de", such as "device", "denote", etc. The use of proximity searches within five, ten, or twenty five words is also well known, and supported by the interface of the present invention.

15 The Save Search button function 308 allows the user to save the search in a separate table which may be retrieved later for viewing, editing, or adding into other searches by clicking on the "Get Saved Search" button function 309. The Get Saved Search button function 309 lists all previously saved searches. A user may select any of the previously searched items to view. The saved 20 searches are listed in alphabetical and chronological order. The activation of the button function Word List 306 results in a list of all words which exist in the patent or library.

25 Referring to Figure 24 and Figure 3, the placement of cursor 44 over the Word List button function 306, and the momentary depression of switch 46 on the mouse 42, results in the generation and display of a word list dialog box 310, illustrated in Figure 24. The word list dialog box 310 includes an alphabetized listing of all words which exist in the selected patent, or all 30 patents in a library, with a numerical identifier indicating the number of times the particular word occurs appearing in the left hand column of the word list. For example, within the Detkin Library and the selected patent, the word "abandon" occurs seven times. Similarly, the word "ability" occurs two

times. By placing cursor 44 over a letter tab of the list, the user is able to quickly maneuver through the list of words. For example, as shown in Figure 25, by placing cursor 44 over the letter "D" and momentarily clicking switch 46, computer 48 generates and displays a listing of all words beginning with the letter "D" within the selected patents within the field of search identified in box 302. In addition, it will be noted that through the use of a scroll bar 311, the word list is scrollable. The selection of the word "data" from the word list results in the word automatically appearing in the search window 304. Placing the cursor 44 over the "wild card"(\*) button function 314, permits the user to identify all words which begin with the selected word and any additional characters following the word. For example, if the user has selected the letters "de" and attached a wild card" at the end of the word (for example, de\*), then the search dialog box 302 will locate all words which begin with the letters "de" and have any ending attached thereon. In addition, the "wild card"(\*) may be placed in front of a suffix. For example, if the user enters the word "\*tion", the search dialog box 302 will find all words which end with the letters "tion".

Assume for example that the user desires to initiate the search identified in Figure 25 having the search word "data" in window 304 for the current library. By placing the cursor 44 over the search button of the box 302 and clicking switch 46, computer 48 in Figure 3 generates and displays a Search Results box 320, as shown in Figure 26. The Search Results box 320 lists the number of times the selected word occurs in all of the patents of the particular library. In the present example, the Detkin Library comprises twenty three patents that contain the search word, "data". The display area 329 shows the '233, '125, '742, '660, '262, '056 and '055 patents. The other sixteen patents will appear in the display over 329 as the user scrolls the area 329 down. As shown in Figure 26, the search term "data" occurs 101 times in patent '233, and 247 times in patent '262. Additionally, it will be noted that the Search Results box 320 identifies the number of patents in which the search term was located, and the number of patents which are selected. The

user may now select a patent to view each of the occurrences of the word "data". Moreover, the Search Results box 320 includes a button function to create a new case, or the user may add the patents to a current case using a separate button function.

5 Assume for example that the user desires to view the Equivalent File of patent '233. The user places the cursor 44 of Figure 3 over a portion of the patent search result listed in box 320. For example, the user may place cursor 44 over the light bulb icon, the number of occurrences (in the current example, 101) or any portion of the patent number, and momentarily depress switch 46. The selection of a patent within box 320 results in the computer 48 of Figure 3 highlighting the selection. Double-clicking on the selection, or 10 the activation of the View button function 325 results in computer 48 displaying the Equivalent File of the library version of the patent, and displaying all instances of the search term (in the present example, the word "data"). As illustrated in Figure 28, in the presently preferred embodiment 15 of the invention, the Equivalent File of the selected patent is displayed on display 68 of Figure 3 in the left hand portion of the screen 68 within an Equivalent window 160. The repetitive activation of the right arrow button 351 results in the navigation to each "hit" of the search term in the equivalent 20 patent text. Also illustrated in the figures as part of the equivalent window 160 are (+) button functions 372 and (-) button function 374 (see for example, Figure 27). The activation of the plus function 372 or minus function 374 25 results in computer 48 of Figure 3 displaying the Equivalent File, in increments based on the column numbers. For example, the activation of the plus button 372 will result in the next column of the patent being displayed in the Equivalent window 160. The activation of the minus button 374 results in a decrement so that the previous column of the patent is displayed. Additionally, the present invention supports the scrolling of the Equivalent File 30 in window 160, such that the text may be scrolled through any displayed column.

As illustrated in Figure 26, the Search Results dialog box 320 includes a Select All button function 328. The activation of the Select All button function 328 results in the selection of all patents in the results list displayed in area 329. The selected patents can be added to the current case or create a new case with the search results displayed in area 329.

5 As illustrated in Figure 27, the selection of the button function Library/Case Cross-reference from menu 150 (see Figure 15) results in the display of a Library to Case Cross Reference dialog box 350. The Library/Case Cross-reference dialog box 350 permits the user to view a list 10 of all patents on the current library cross referenced to the cases in which they are utilized. As illustrated, the dialog box 350 "floats" over the other displayed windows, such as for example, the equivalent window 160, and may be selectively placed at any location on screen 68 of Figure 3, as may many 15 of the present invention's dialog and control boxes.

15 Assume for example that the user selects the view button function 325 of the Search Results dialog box 320 in Figure 26. The computer 48 of Figure 3 displays the Equivalent File of the selected patent (in the example of Figure 28, the '478 patent) and highlights all instances of the search term occurring in the Equivalent File displayed in equivalent window 160. 20 Additionally, computer 48 generates and displays the Patent Text Toolbox 162, which takes the form of a window which may selectively be moved and retained anywhere on screen 68 in Figure 3. As shown, Patent Text Toolbox 162 includes a number of button functions including a right arrow button function 351, a left arrow button function 352, a patent identifier box 355 25 which identifies the currently displayed patent, and a down arrow button 165 which, upon selection, displays a menu including section headings of the patent currently being displayed. As illustrated, the Patent Text Toolbox 162 further includes a "Hit" window 360 which identifies the occurrence number 30 of the search term. For example, in column 3 of the '478 patent illustrated in Figure 28, the first occurrence of the search term would be described in window 360 as "Hit 1 of 25", where the total number of occurrences of the

term number 25. By activating the right arrow button 351, the next Equivalent File is scrolled to the occurrence of the search term in equivalent window 160.

5 In Figure 28, the sub-heading "Brief Description" is currently selected. By activating button 165, all other headings of the patent (for example, Background of the Invention, Prior Art, etc.) are displayed for the particular patent as previously described with reference to Figure 14. It should be noted by the reader that the listing of headings displayed by the activation of button 165 is a listing of the actual headings in the patent selected. Since patents, 10 like many other documents, are tailored by the author of the document and identified by unique headings, computer 48 of Figure 3 generates and displays the actual headings used in the particular patent which was selected, as opposed to pre-defined headings which may or may not apply to the specific patent which is being viewed.

15 With reference now to Figure 29, Patent Text Toolbox 162 includes a plurality of marker icons 381, 382, and 384, which represent markers of varying colors for highlighting portions of the text in the displayed Equivalent File, as will be described more fully below. A pen icon is also provided for identifying portions of patent text. As previously described, the activation of 20 right arrow button 351 results in computer 48 of Figure 3 scrolling through each sequential instance ("hit") in which the search word is encountered after the first instance. By activating left arrow button 352, the reverse order will be generated by the computer 48 of each instance of the selected search term. As the instances of the search term are incremented or decremented, 25 respectively, the window 160 is updated (e.g. "hit 5 of 24", "hit 2 of 24", etc.). Moreover, it will be noted that in Figure 28, the Patent Text Toolbox 162 also includes a library icon or a case icon. The display of a library icon indicates that the Equivalent File of the patent displayed in the Equivalent window 160 is a library copy. As a library copy, the user may not make 30 notes or highlight the Equivalent File. A working Equivalent File is denoted by a case icon (similar to icon 106) in place of the library icon (see Figure

29). As described herein, the working Equivalent File may be searched, annotated and/or highlighted by the user.

Further, it will be noted that the current heading identifier (for example, "Brief Description") illustrated in the box 162 corresponds to the text displayed in the upper portion of window 160. Thus, in the example illustrated in Figure 29, the bibliography begins at column B1. Since the upper portion of the display window 160 displays the bibliography of the patent, the heading identifier within box 160 identifies the currently viewed portion of the patent as the "Bibliography".

10 Referring now to Figure 30, the Equivalent File of patent '478 includes location identifiers for various sections of the Equivalent File displayed. In the example illustrated in Figure 30, the Bibliography section of the patent is identified by the letter "B". The letter B (400) appears vertically along the length of the column B1 in the patent equivalent '478. In the presently preferred embodiment, the B identifier 400 is in the color blue. Referring to 15 Figure 30 and Figure 3, placing the cursor 44 over any one of the letter Bs and clicking switch 46 on mouse 42, the corresponding bitmapped image file of the Bibliographic official United States patent document is displayed in an image window 410 on display 68. The linking between the Equivalent File 20 displayed in Equivalent window 160 and the PTO Image File displayed in image window 410, was previously described with reference to synchronization in this specification.

25 The present invention provides the user with the ability to view multiple versions of the same patent on display 68 in Figure 3. In Figure 31, the patent Equivalent File displayed within the window 160 represents the searchable ASCII text equivalent of the official United States patent, as previously described in this specification. The patent image displayed in image window 410 of the screen 68 represents the PTO Image File of the official United States Patent, including the figures for the patent. As 30 previously noted, the image patent in window 410 is not searchable, and is not in an ASCII text format, but may be manipulated and enlarged within the

5 window 410 as may any bitmapped image. As shown in Figure 30, window 410 includes a down arrow button function 415 that is used to minimize window 410 and a minus button function 420 (see Figure 31) that is used to scroll down the window 410 by page. Also illustrated in Figure 30 is a Patent Image Toolbox 430, which may be selectively positioned anywhere on display 68 by the user. Patent Image toolbox 430 includes a variety of functions which may be employed when operating on the patent image in window 410. One of these functions includes a rotate image icon 435 which, upon activation, rotates the image horizontally, then back vertically, if the icon 435 is activated again. The Patent Image Toolbox 430 further includes a Go To 10 element icon 437, which, upon activation, permits a user to type in using keyboard 56 of Figure 3, an element number (from, for example, a drawing displayed in image window 410). The computer of the present invention then searches the Equivalent File of the patent displayed in Equivalent window 160 and displays that portion of the Equivalent File in which the first instance of 15 the element number is described. The Patent Image Toolbox 430 also includes various magnification icons, for example, a "1X" icon 440, a "2X" icon 442, and a "3X" icon 445. The activation of icon 442 results in a zoom option, such that medium resolution is achieved and the image displayed within the 20 image window 410 is enlarged. The activation of icon 445 results in a three times zoom option to permit a user to view images displayed within image window 410 with the highest degree of resolution in the presently preferred embodiment.

25 As illustrated in Figure 31, the toolboxes of the present invention may be selectively placed at any location on the screen 68. To move a toolbox to a different location, cursor 44 of Figure 3 is placed over a portion of a top bar area (for example, top bar 450 of box 430 in Figure 30, or top bar 455 of box 162 in Figure 31). Referring to Figure 31 and Figure 3, once the cursor 44 is placed over the top bar area of a toolbox, switch 46 is depressed, thereby 30 resulting in the effective coupling of the cursor 44 to the toolbox. The movement of the mouse 42 results in a corresponding movement of both the

cursor 44 and the toolbox, such that the toolbox may be placed at any location on screen 68. Cursor 44 may be decoupled from the toolbox by simply releasing the switch 46.

Referring once again briefly to Figure 30, it will be noted that the image window 410 includes a vertical scroll bar 460, and a horizontal scroll bar 470. Using the vertical scroll bar 460, the image displayed within the image window 410 may be scrolled vertically. Similarly, the use of the horizontal scroll bar 470 permits the horizontal scrolling of the image illustrated in the image window 410. Moreover, a minus function ("-") 472 and a plus ("+") function 474 are provided along the vertical scroll bar 460. Functions 472 and 474 permit a user to navigate through images of both the drawings and text (the complete PTO Image File) of the patent displayed within the image window 410. Accordingly, it will be appreciated by one skilled in the art, that a user may view the image of a patent in window 410, and the text equivalent in equivalent window 160, in an unsynchronized manner, or in a synchronized fashion, as described herein. The keyboard 56 in Figure 3 includes a "up PG" key and a "down PG" key to allow for the unsynchronized viewing of the images within window 410 as well.

Referring now to Figure 32 and Figure 3, there is shown the example wherein cursor 44 is placed over down arrow button 165 of the control box 162 and switch 46 is activated. Computer 48 generates the list 170 which displays the various groupings found within the displayed patent (in the present example, patent '027). As shown, patent '027 includes a "Bibliography", an "Abstract", "Background of the Invention", Brief Description of the Drawings", Detailed Description of the Invention", and "Claims". By placing the cursor 44 over any of the sections listed in the list 170, and clicking switch 46, computer 48 displays the selected text portion of the Equivalent File (for example, "Bibliography" in Figure 32) within window 160.

Referring to Figure 33 and Figure 3, the present invention provides a mechanism by which a user may view corresponding patent drawings in the PTO Image File displayed in window 410, by selecting figure numbers in the

Equivalent File within window 160. By placing cursor 44 over a figure number in the Equivalent File displayed in window 160, and momentarily double-clicking switch 46 on mouse 42, CPU 48 locates and displays the image of the corresponding figure within the image displayed in window 410 (see Figure 33). It will be appreciated that the present invention's capability of locating and displaying the selected figure within the image window 410 is due to the synchronization of the Equivalent File in window 160 with the PTO Image File displayed within image window 410, as previously described in sections above. As will be appreciated, the synchronization of the Equivalent File with the PTO Image File, permits a user to place the cursor 44 over a reference to a figure within the Equivalent File, activate the cursor control device, and thereby view the corresponding figure within the image window 410.

To enlarge a portion of the figure displayed in the image window 410, the user places cursor 44 over the area of the image where the enlargement is desired and depresses switch 46. CPU 48 then generates a dynamic outline box 500 (see Figure 34). By continuously depressing switch 46 and selectively moving mouse 42, the user defines an area within the outline box 500 to be enlarged. The user then releases switch 46, and as shown in Figure 35, that portion of the image in window 410 disposed within the outlined box 500 is enlarged and displayed in the window 410. In the example illustrated in Figures 34 and 35, the user has defined an outline box 500 over a portion of Figure 3 of the '478 Patent. The enlarged portion is then displayed as shown in Figure 35. Additionally, as previously described, other controls are provided in the Patent Image Toolbox 430 for rotation of the image, enlargement of the image in set increments, and to provide additional functions in operating on the image within the window 410.

Referring to Figure 35 and Figure 36, assume for example that a user desires to locate the first instance in the Equivalent File of patent '478 which refers to element 28. In a typical application of the present invention, the user will locate a particular element number of interest illustrated in the figures of

the patent (and displayed within image window 410). The activation of icon 437 of the Patent Image Toolbox 430 in Figure 35 results in display of a Select Element Number dialog box 502 in Figure 37. Using the keyboard 56 of Figure 3, the user may input the particular element number of interest, and activate a Find In Text button function 504 provided in the Select Element Number dialog box 502. The present invention searches and then finds the first and the subsequent instances of the selected element number within the Equivalent File, and displays in highlighted form the text in window 160 beginning at the first instance ("hit") location in the patent. The subsequent instances are also highlighted. To view each instance that the element is found, the user proceeds to click the mouse switch 46 while the cursor 44 is placed on the right arrow button 351 in Figure 30. When every instance of the element has been viewed, a further click on the right arrow button 351 in Figure 30 will indicate in the Patent Text Toolbox 162 that there are no more hits.

Referring now to Figure 37 and Figure 3, the present invention's highlight functions will be described. To highlight text within a case copy of the Equivalent File displayed in window 160, a user places cursor 44 over a marker having a desired color. In the presently preferred embodiment, marker icons 381, 382, and 384, are displayed as having different colors in the Patent Text Toolbox 162. By placing the cursor 44 over one of the marker icons, such as for example marker icon 381, and momentarily clicking switch 46, the marker color is selected. The movement of cursor 44 into the area defined by window 160, results in cursor 44 having the visual appearance of a marker tip similar to that shown in icon 381. By placing the cursor 44 over a desired portion of text within the Equivalent File displayed in window 160, and depressing switch 46, the marker is "turned on". Dragging the cursor 44 over the text to be highlighted, results in that portion of the text having a color tint corresponding to the color of the marker which has been selected. The marker may be turned "off" by releasing switch 46 on mouse 42. In Figure 37, a portion of the text has been highlighted and identified as a highlighted

area 540. Due to the limitations of the written specification and the inability to illustrate color, the highlighted area 540 is simply shown as a black rectangle. Additionally, a corresponding color indicator 542 is displayed next to the highlighted text 540. As will be described more fully below, placing 5 cursor 44 over color indicator 542 and clicking switch 46 results in the patent note window, originally connected to this location in the Equivalent File, being displayed on screen 68 in which the user may read or type notes related to that portion of the highlighted text. Color indicators have different shapes to aid in identification by users with monochromatic display screens, or those with 10 color blindness.

In the presently preferred embodiment, color indicator 542 further identifies the color by using symbols. For example, in the present embodiment, if a red marker is selected, color indicator 542 is round and red. However, if a yellow marker is selected, then the color indicator 542 is in the 15 shape of a yellow triangle, or if a green marker is selected, color indicator 542 is in the shape of a green rectangle. Additionally, it is possible using the teachings of the present invention to overlap marker colors over the same area of text. By overriding one marker with another, multiple patent notes for the same text may be created. If a given portion of text within window 160 has 20 been highlighted, multiple color indicators 542 will be displayed in a horizontal row adjacent to one another. Clicking on any of the color indicators (542) results in the display of the corresponding patent note.

Referring now to Figure 38, the present invention's graphic user interface permits multiple copies of the same or different patents to be viewed 25 simultaneously. In the example illustrated in Figure 38, window 160 is displaying a case copy of the Equivalent File of the '027 patent. As a case copy, the user may search edit, and highlight the Equivalent File of the '027 patent displayed in the window 160. As shown, an image of the '027 Patent, with an enlarged area from its Figure 3 is displayed in the window 410 of screen 68 in Figure 3. Additionally, a library Equivalent copy of the '027 30 patent is also displayed in a third area 555 on display screen 68. As a library

copy, the Equivalent File displayed in window 555 is not annotatable or highlightable by the user, but may be searched, and used for purposes of comparison to the figures in window 410, or the notes or other modifications which a user may make in window 160 to the case copy of the Equivalent File.

5

Referring to Figure 39, the selection of the Import Patents option from the Library menu results in the display of an Import Patents dialog box 560. The Import Patents dialog box 560 permits the importation of additional patent Equivalent Files into a library file. As illustrated in Figure 40 and Figure 3, by placing cursor 44 over a selected Equivalent File to be imported and momentarily clicking switch 46, the selected Equivalent File is highlighted. Once the selected patent Equivalent File is highlighted, cursor 44 is placed over an OK button 562 and switch 46 is once again clicked. The Equivalent File is then imported into the current library file.

10

Figure 41 and Figure 3, the placement of cursor 44 over the Case icon

106 and the depression of switch 46 on mouse 42 results in the display of a Case menu bar 570. As illustrated, a variety of sub-command items are displayed in Case menu 570, including sub-command items identified as New Case, Open Case, Update Case, Copy Case, Close Case, Search, Set Case Directories, Backup Case, Restore Case, Delete Case, Print, Print Setup and Exit. If cursor 44 is placed over the Open Case sub-command item and switch 46 is clicked, an Open Case dialog box 580 is displayed (see Figure 42) which includes an area 587 in which all of the cases accessible are displayed. In the present example, the case "Infringement study" is selected by placing cursor 44 over any portion of the words "Infringement study", or on the briefcase icon 590 adjacent to the words "Infringement study". Alternatively, in the event the New Case sub-command item is selected from case menu 570, the computer 48 generates and displays a New Case control box 594 (see Figure 43).

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The user may define, by inserting into the appropriate fields, a new case by identifying the case name, attorney name, client name and date in which the case was opened. Once these fields have been inputted by the user, an OK

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button 600 is activated by placing cursor 44 over the OK button 600 and momentarily clicking switch 46.

Referring to Figure 43 and Figure 2, assume for example that the user has selected the case identified as "Demonstration" following the steps 5 described with reference to Figure 42. By placing cursor 44 over the down arrow 109 on the tool bar 103 and depressing switch 46 on mouse 42, computer 48 generates and displays a menu 610 listing all patents comprising the case "Demonstration". By placing cursor 44 over any one of the listed 10 patents comprising the case "Demonstration", and clicking switch 46, the Equivalent File of the selected patent will be displayed, including any previous highlights, patent notes or other edits made by a user in prior sessions.

Referring to Figure 45, the selection of the sub-command item Update Case from the case menu 570 (see Figure 41) results in the display of an 15 Update Case dialog box 615 in which the current case name, attorney name, client and date of opening of the case are displayed. A user may update this data by making the necessary modifications within the appropriate fields and activating an OK button function 620. The selection of the Search 20 sub-command item from menu 570 results in the display of a Search Case dialog box 635 illustrated in Figure 46. Using box 635, the user may perform searches on patents located in case files, or the library, in a manner similar to that described with reference to the search box 302 in Figure 24.

Referring now to Figure 47, the selection of the Set Case Directories 25 sub-command item of menu 570 (see Figure 41) results in the generation and display of a Set Case Directories dialog box 640. As illustrated, the Set Case Directories dialog box 640 includes a variety of features for the manipulation, including addition and removal of directories. The Set Case Directories dialog box 640 also permits the user to define case default directories where cases 30 will be created. A warning message will appear when a user accesses this command, since modifications of this function will affect the ability to access cases. In operation, a user may double-click on a directory illustrated within an area 642 of the dialog box 640 to select the directory and open it. The

directories contained in the selected directory will be listed below the selected directory within the window 642. Similarly, various drive icons are provided that represent resources to the computer system of the present invention. All 5 directories contained on the selected drive are then listed in the directories list. As shown in Figure 47, the selected directory is identified, as is the default directory. Once a user has chosen a directory from which cases will be found, the activation of a button function Add Directory 644 adds the selected directory to the directories containing cases shown in an area 646. A Remove Directory function 650 removes the selected directory from the path list such 10 that the directory will no longer be used when finding cases. A Set as Default function 652 sets the currently set directory as the default directory. When setting directories for cases, the default directory is the directory where new cases are created. When setting directories for libraries, the default directory is where new libraries are created.

15 Referring to Figure 48, the selection of the function Copy Case from menu 570 (see Figure 41) results in the display of a Copy-to-Case dialog box 700 illustrated in Figure 48. The Copy-to-Case dialog box 700 permits a user to copy information from an existing case into the current case. In operation, a click down menu is selected and displayed through activation of a downward 20 arrow button function 702. The click down menu includes a listing of all cases which a user may choose from to copy into the currently active case. In the present specification, the click down menu is not shown for sake of brevity. The user then has the option of identifying case notes, patents, or 25 patent notes to copy from the selected case. If the user checks the case note icon 704, all case notes from a selected case will be listed in alphabetic order in the list area 710. If the patents icon 706 is selected, all patents from the selected case will be listed after any case notes in the list area 710. If the patent note icon 708 is selected, all patent notes from the selected case will be listed after each patent in the list area 710. An area 710 is provided within 30 the dialog box 700 in which all patents are listed in ascending order from the lowest number to the highest number, as well as their associated case and

patent notes. A user may then click on each item within the window 710 which is to be copied.

5 The selection of the Backup Case option from menu 570 (see Figure 41) results in a Backup Case dialog box 720 being displayed on screen 68 as shown in Figure 49. A user may utilize the Backup Case dialog box to save a current case onto a backup disk or directory, or onto another computer. A user enters the backup drive and directory within a display window 722 of the dialog box 720 using keyboard 56. Once entered, the button function OK 725 is activated and the case is backed up to the defined location.

10 Referring to Figure 50, a case may be deleted by the selection of the Delete function in menu 570 (see Figure 41) which results in the display of a delete case dialog box 730 as illustrated in Figure 50. A case may be deleted using this dialog box including all case notes and all patent notes.

15 The selection of the Print command from menu 570 of Figure 41 results in the display of a Print dialog box 750, as shown in Figure 51. The Print dialog box permits the printing of various files, including but not limited to, patent images, case and patent notes and Equivalent Files on a printer 57 in Figure 3 or to a file. Selection of a Print Setup command in menu 570 of Figure 41 results in the display of a print setup dialog box 755, as shown in 20 Figure 52. The Print Setup dialog box 755 permits a user to set up printers, paper orientation, resolution, size and source of paper. In addition, default printers may be selected, and if the user is utilizing a network printer, the printer server information is listed in the print setup dialog box along with the printer/default printer setup options.

25 Referring now to Figure 53, the selection of the Edit function from menu bar 102 results in the display of Edit menu 760. As illustrated, the Edit menu 760 includes sub-command items Undo, Cut, Copy, Paste, Delete, Find and Find Next, Replace, and Go To Column. As illustrated in Figure 54, the selection of the View command option on menu bar 102 results in the 30 generation and display of a view menu 765. The View menu options include preferences, screen layout, and status bar. The selection of the Preferences

option on menu 765 results in the display of a Preferences dialog box 770, as shown in Figure 55. The Preferences dialog box 770 permits a user to set preferences for sorting and opening various patent notes. Also included in the Preferences dialog box 770 is the option to open a patent window when the note is created. Patent notes can be sorted by title, color and location. The activation of the "Open Patent Note Window When Note is Created" results in the patent note window being displayed every time a highlight is made within window 160. A user may deactivate the feature so that the note window is not displayed when the highlights are done. The selection of the function "Sort Patent Note by Title" results in the patent notes being sorted in an alphabetical and ascending numerical order. If the patent notes are sorted by color and title, then the present invention separates the red, green and yellow notes, and arranges them in alphabetical and numerical order. If the patent notes are sorted by location in the Equivalent File, the present invention lists the patent notes as they appear from the beginning of the patent Equivalent text displayed in window 160, to the end of the patent, disregarding alphabetization and color coding.

The selection of the Screen Layout function of menu 765 in Figure 54 results in the display of a Screen Layout dialog box 780 as shown in Figure 56. Referring to Figures 56 and 57, the Screen Layout dialog box permits a user to arrange the Equivalent File in window 160 and the image displayed within the image window 410 on the screen 68 of Figure 3. In the presently preferred embodiment, four layout options with the choice of up to four windows to be active simultaneously are provided to the user. The four screen layout options are denoted by icons to the left within an area 782. As shown in Figure 56, within the area 782, four layouts are provided in icon form, namely, layout 783, 785, 787, and 790. It will, of course, be appreciated by one skilled in the art that additional layouts may be provided within the Screen Layout dialog box 780, and supported by the present invention. The selection of icon 783 results in the display of two equivalent windows simultaneously. In operation, the two equivalent windows may be two views of the same patent

or of different Equivalent Files. The selection of icon 785 results in the display of one equivalent window (for example window 160) and one image window (for example image window 410), simultaneously. The selection of icon 787 results in the display of two equivalent windows and one image window, simultaneously. The selection of icon 790 results in the display of two equivalent windows and two image windows simultaneously. Additional features of the Screen Layout dialog box 780 are provided, including downward arrow icon 800 and a downward arrow icon 805, as shown. The selection of the downward arrow icon 800 results in the display of a menu listing of patents in the selected case or library, identified as "Patent 1" in the Screen Layout dialog box 780. The selection of downward arrow icon 805 results in the display of a menu listing the patents within the selected case or library, identified as "Patent 2". Placing cursor 44 of Figure 3 over the case icon 807 or case icon 809 permits a user to select a patent from the current case. Similarly, placing cursor 44 over a library icon 810 or library icon 812 and activating the mouse results in the user selecting a patent from the current library.

Referring again to Figure 56, in the event the icon 785 is selected, the present invention displays a text equivalent window 160 on a left-hand portion of screen 68, and an image window 410 on the right portion of screen 68 of Figure 3, as illustrated in Figure 57. The selection of icon 783 results in the display of two equivalent windows simultaneously, as shown in Figure 58. The selection of icon 790 results in the screen layout illustrated in Figure 59. As shown in Figure 60, an equivalent window 160, an image window 410, and a second equivalent window 835 and a second image window 850 are simultaneously displayed on screen 68.

Referring now to Figure 60, selection of the Window option of the menu bar 102 results in the display of a Window menu 900. Window menu 900 includes sub-command items Cascade, Tile, Arrange Icons, and a listing of all open windows. Selecting a window from this list will bring the window to the top.

The selection of the patent note icon downward arrow 127 (see Figure 11) results in the display of a menu 902 in Figure 62 listing all patent notes which have been sorted according to the specifications in the preferences dialog box 770 in Figure 56. As shown, the patent notes include various symbol icons in appropriate colors as well as a numerical indicator of the patent note number. As previously discussed, various markers of different colors are provided for highlighting portions of text of the Equivalent File.

Referring now to Figure 62 in conjunction with Figure 61, placing cursor 44 of Figure 3 over any of the patent note selections in menu 902 and clicking the mouse button results in the contents of the note being displayed. In the example of Figure 62, each patent note includes a title 905, and an area 910 in which the user may input text through keyboard 56 in Figure 3. Moreover, as illustrated in Figure 63, a user has the option of opening multiple patent notes simultaneously. As will be appreciated from Figure 63, each patent note includes text, as well as the notation as to the column and line number of the highlight to which the patent note corresponds. Moreover, a geometric shape indicator 909 (for example, in Figure 63, a square, triangle, and circle) in the appropriate color corresponds to the highlight in the Equivalent File within, for example, window 160 in Figure 63. In the example of Figure 63, the user has selected the multi-note mode and created notes using different colored highlighter pens within the Equivalent File displayed in window 160.

Continuing to refer to Figure 63, the present invention can copy and paste a portion of, or an entire external file, such as a deposition, an interrogatory, or an article into the patent note. A user can also search for a term or terms in the patent note. In addition, when the user clicks on a portion of the text in the patent note or an indicator 909, a portion of the text relating to the particular patent note is displayed in the equivalent window 160.

Figure 64 illustrates a case note window entitled "Case Note 2". As shown, Case Note 2 comprises a window 920 having a case note title area 925 and an open text area 930. A user may define the case note title 925, and

input text regarding a particular case directly into area 930 using the keyboard 56 in Figure 3. In addition, the user can copy and paste a portion of or a whole file into a case note as well as search for a term, or terms in the case notes.

5 Figure 65 illustrates the minimization of libraries, patents, search results, patent and case notes to icons to conserve real estate space on screen 68 in Figure 3. In as much as the minimization of documents and the like are known in the art, no further description of the minimization utilized by the present invention is provided in this specification.

10 Figure 66 illustrates the Go To dialog box 955 of the present invention which permits a user to directly input a column number into a field 960, using keyboard 56 in Figure 3. The activation of an OK button 965 results in the display of the designated column of the Equivalent File in the equivalent window 160. In practice, it has been found that the quickest method for 15 locating and displaying a specific column in the Equivalent File is through the use of the Go To column dialog box 955. Figure 67 illustrates the present invention's Go To Section dialog box 970. The dialog box 970 includes the downward pointing arrow function 972, the activation of which results in the display of all sections in the particular patent displayed within the equivalent window 160. The Go To Section dialog box 970 is provided as a method for 20 navigating from section to section within the Equivalent File displayed in the equivalent window 160. The selection of a section, and the subsequent display of the section, in the equivalent window 160 obviates the need to search page by page for the desired section in the Equivalent File.

25 Referring now to Figure 68, the selection of the Help function from menu 102 results in the display of a Help menu 980. Help menu 980 includes various sub-command options, including Help Index, Getting Started, Learning PatentWorks™, and About. The selection of the About command results in the display of an About information box 982, shown in Figure 69. The About 30 dialog box 982 lists information on the invention comprising the subject of this

application, copyright information and other pertinent information related to the product.

Referring to Figure 70, the selection of the Note function of menu 102 results in the display Note menu 987. The Note menu 987 includes a variety of options including New Case Note, View Case Note, View Patent Note, Find, Find Next, Replace, and Go To Highlighted Text. The selection of the View Case Note option results in the display of a Case Notes in Case dialog box 990 as shown in Figure 71. Box 990 permits a user to select a case note to view. An area 992 in box 990 lists all of the case notes in the current case. The user may then select a single case note to view.

The selection of the View Patent Note option of menu 987 of Figure 70 results in the display of a Patent Notes in Case dialog box 994 shown in Figure 72. Box 994 permits a user to select a patent note to view or to delete. Patent notes are sorted as specified in the preferences dialog box 770 in Figure 56, then by the patent note number. A user may select one of the patent notes by placing the cursor 44 of Figure 3 over the note and by clicking the switch on the mouse.

The user interface of the present invention includes a number of additional features, as described below.

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### *Copy Claims*

As described above, during pagination the PTO text file is analyzed to identify Section headings (see Figure 10 and the section above entitled "Initial Automatic Pagination"). During such processing, a linked list 7902 (shown in Figure 79) is generated. The actual implementation of the linked list 7902 is implementation dependent. For example, the linked list 7902 may be implemented as a doubly linked list (this is the case shown in Figure 79).

The linked list 7902 is synchronized with the corresponding text file 7908, and is used to quickly navigate through the text file 7908. The linked list 7902 includes a record 7904A-7904N for each section in the text file 7908

5 (in the example of Figure 79, the text file has N sections). Each of these records 7904A-7904N includes a pointer 7906A-7906N that points to the top of the corresponding section in the text file 7908. For example, record 7904A corresponds to Section 1 in the text file 7908. This record 7904A contains a pointer 7906A that points to the top of Section 1 in the text file 7908. The records 7904A-7904N may also include other information, such as the section names (represented in Figure 79 as "1", "2", . . . , "N").

10 The user interface of the present invention includes a user-selectable feature called "Copy Claims to Clipboard". This is an option that is available from the menu bar. When the user selects this option, the claims are automatically copied to the clipboard (or, alternatively, to a user specified file). It should be understood that this feature is also applicable in a non-patent context. For example, this feature can be used to automatically copy any user specified section from the text file to the clipboard (or to a user specified file). However, this feature is particularly useful in a patent context. 15 For example, this feature greatly simplifies the generation of claim charts that are often included as part of validity and infringement opinions.

20 The operation of the present invention according to this feature is depicted in a flowchart 8002 in Figure 80. Flowchart 8002 begins with step 8004, where control immediately passes to step 8006.

25 In step 8006, the last section heading in the text file is automatically located (as will be appreciated, the last section in a patent is the claims section). This is preferably done by using the linked list 7902. In particular, the last section heading in the text file 7908 is located by following the pointer 7906N in the last record 7904N of the linked list 7902.

In step 8008, all text in the text file that follows the last section heading is automatically extracted from the text file.

30 In step 8010, this extracted text is copied to the clipboard (or to a user specified file). Operation of flowchart 8002 is complete after performance of step 8010, as indicated by step 8012. It should be understood that these

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operations are performed automatically, without any input or direction from the user.

### *Zoom Image*

The user interface of the present invention includes a "Zoom Image" 5 feature that may be selected by an operator. The operator can use this feature to magnify a selected portion of the image currently being displayed. As discussed above with reference to Figures 75, 76A, and 76B, the uncompressed PTO image file is compressed to a 1D (one dimensional) image file. This is done to reduce storage requirements. According to the present 10 invention, zooming operations involve a transformation from the 1D image file directly to the image that is ultimately displayed on the monitor. This is done to increase the overall speed of the present invention.

The manner in which the zoom image operation is performed is generally depicted in Figure 81, which shows a 1D compressed image 8102. 15 For illustrative purposes, this 1D compressed image 8102 is shown as having four lines 8104A-8104D. The compressed image 8102 is supplied to a data decompressor 8106, which is preferably implemented as a processor operating according to control logic (software). Alternatively, the data decompressor 8106 is implemented as a hardware state machine. The data decompressor 20 8106 decompresses the compressed image 8102 to the degree indicated by the operator's zoom request. For example, the operator may have requested a 75 DPI (dot per inch) or a 150 DPI zoom. Operation of the data decompressor 8106 results in a decompressed image 8108, that is displayed in the image window 8110.

25 The operation of the data decompressor 8106 shall now be further described with reference to a flowchart 8202 in Figure 82. Flowchart 8202 begins with step 8204, where control immediately passes to step 8206.

In step 8206, the operator selects the zoom image option. The operator 30 does so in order to zoom a portion of an image currently being displayed. Preferably, the portion of the image that is to be zoomed is indicated by the

current position of the cursor or mouse (i.e., the portion of the image proximate to the current position of the cursor or mouse is the area that is to be zoomed), although other selection mechanisms could alternatively be employed.

5 Also in step 8206, the operator indicates the desired zoom level. Preferably, there are three zoom levels: 300 DPI (dots per inch), 150 DPI, and 75 DPI. However, the present invention can alternatively support additional zoom levels. The operation of the present invention according to such additional zoom levels will be apparent to persons skilled in the relevant 10 art based on the discussion contained herein.

15 A zoom level denotes both magnification level and resolution (i.e., the amount of data used to represent the final, zoomed image). According to the present invention, the 300 DPI zoom level is the greatest magnification level, and is of the highest resolution. The 150 DPI zoom level is one half the magnification of the 300 DPI level, and is one half the resolution (that is, the 150 DPI level uses one half the data to represent the final image as the 300 20 DPI level). The 75 DPI zoom level is one fourth the magnification of the 300 DPI level, and is one fourth the resolution (that is, the 75 DPI level uses one fourth the data to represent the final image as the 300 DPI level).

25 If the operator selected the 300 DPI zoom level in step 8206, then step 8208 is performed. In step 8208, the data decompressor 8106 fully decompresses that portion of the 1D compressed image corresponding to the portion of the image currently being displayed that the operator wishes to zoom (this portion of the image currently being displayed was selected in step 8206). The phrase "fully decompresses" means that the decompressor 8106 decompresses every bit in every line of this portion of the 1D compressed image. Procedures for performing this decompression operation will be apparent to persons skilled in the relevant art. In step 8214, the data decompressor 8106 transfers this decompressed data to the image window 30 8110 for display.

If, instead, the operator selected the 150 DPI zoom level in step 8206, then step 8210 is performed. In step 8210, the data decompressor 8106 partially decompresses that portion of the 1D compressed image corresponding to the portion of the image currently being displayed that the operator wishes to zoom. Specifically, the decompressor 8106 decompresses every other bit in every other line of this portion of the 1D compressed image. The decompressor 8106 is able to ignore (i.e., not decompress) all other bits in all other lines since, as discussed above, the 150 DPI level uses one half the data to represent the final image as the 300 DPI level. This results in a significant increase in overall system processing speed (since it is necessary to only decompress a portion of the 1D compressed image). In step 8214, the data decompressor 8106 transfers this decompressed data to the image window 8110 for display.

If, instead, the operator selected the 75 DPI zoom level in step 8206, then step 8212 is performed. In step 8212, the data decompressor 8106 partially decompresses that portion of the 1D compressed image corresponding to the portion of the image currently being displayed that the operator wishes to zoom. Specifically, the decompressor 8106 decompresses every fourth bit in every fourth line of this portion of the 1D compressed image. The decompressor 8106 is able to ignore (i.e., not decompress) all other bits in all other lines since, as discussed above, the 75 DPI level uses one fourth the data to represent the final image as the 300 DPI level. Again, this results in a significant increase in overall system processing speed. In step 8214, the data decompressor 8106 transfers this decompressed data to the image window 8110 for display. The operation of flowchart 8202 is complete after step 8214 is performed, as indicated by step 8216.

### *Copy Image*

The user interface of the present invention includes a "Copy Image" feature where, if selected by the operator (preferably via a menu option), the

image currently being displayed is copied to either the clipboard or a user specified file. This option shall now be described with reference to a flowchart 8302 in Figure 83. Flowchart 8302 begins with step 8304, where control immediately passes to step 8306.

5        In step 8306, the operator selects the portion of the current image (i.e., the image currently being displayed) that he/she wishes to copy. The operator is permitted to do this in any well known fashion, for example, by using the mouse.

10       In step 8308, the operator selects the "Copy Image" option, and selects the desired resolution. Currently, there are four resolution levels (although the present invention can alternatively support additional resolution levels): screen resolution, 300 DPI, 150 DPI, and 75 DPI. Also in step 8308, the operator indicates whether he/she wishes to copy to the clipboard or to a file (which must be specified by the operator).

15       If the operator selected "screen resolution" in step 8308, then step 8310 is performed. In step 8310, the current image as it is currently being displayed is copied to either the clipboard or the user specified file. Preferably, this is accomplished by copying the contents of the image window (as represented in display memory, for example) to the clipboard or the user 20       specified file.

25       If, instead, the operator selected "300 DPI resolution" in step 8308, then step 8312 is performed. In step 8312, the portion of the 1D compressed image corresponding to the portion of the current image that the operator wants to copy (as selected in step 8306) is fully decompressed. As discussed above, the phrase "fully decompressed" means that every bit in every line of this portion of the 1D compressed image is decompressed. In step 8314, this decompressed data is copied to the clipboard or the user specified file.

30       If, instead, the operator selected "150 DPI resolution" in step 8308, then step 8318 is performed. In step 8318, the portion of the 1D compressed image corresponding to the portion of the current image that the operator wants to copy (as selected in step 8306) is partially decompressed.

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Specifically, every other bit in every other line of this portion of the 1D compressed image is decompressed. Such partial decompression is possible since, as discussed above, the 150 DPI level uses one half the data to represent the final image as the 300 DPI level. This results in a significant 5 increase in overall system processing speed (since it is necessary to only decompress a portion of the 1D compressed image). In step 8314, this decompressed data is copied to the clipboard or the user specified file.

If, instead, the operator selected "75 DPI resolution" in step 8308, then 10 step 8320 is performed. In step 8320, the portion of the 1D compressed image corresponding to the portion of the current image that the operator wants to copy (as selected in step 8306) is partially decompressed. Specifically, every fourth bit in every fourth line of this portion of the 1D compressed image is decompressed. Such partial decompression is possible since, as discussed above, the 75 DPI level uses one fourth the data to 15 represent the final image as the 300 DPI level. Again, this results in a significant increase in overall system processing speed. In step 8314, this decompressed data is copied to the clipboard or the user specified file. Processing of flowchart 8302 is complete after step 8310 or 8314 is performed, as indicated by step 8316.

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### *Lock Windows*

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The user interface of the present invention includes a "lock windows" option that may be selected by an operator (preferably via a menu option). The operation of the present invention when the "lock windows" option is selected is represented by flowchart 8402 in Figure 84. When the "lock windows" option is selected, the position of all windows currently being displayed is locked (step 8406). In other words, all movement of the windows currently being displayed is disabled, so that it is not possible for the operator to move the windows.

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This option is useful to prevent operators from accidentally moving the windows. Such inadvertant movement of windows is an inconvenience since it often results in the scroll bars of such windows being pushed out of the display screen, thereby making it difficult for operators to navigate through the windows.

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### *Conclusion*

As described herein, the present invention is implemented to process and display patent text and image files. However, the present invention may be utilized for any application where there is text data and image data that must be analyzed or manipulated in a synchronized and paginated format fashion. One such application is the processing of magazine or book electronic data. This data is commonly stored as text data similar to how patent text data is stored as described in the specification. Magazine and similar data would be far more useful if it were paginated with images of the actual magazine pages. The text and image data could be paginated to produce an Equivalent File that would contain page number, columns numbers within each page, font style information, and position of the first character in each page, column and line increasing ease of navigation and citation.

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Users may perform analysis on publications, for example, in two side-by-side windows, users may perform text searches on the text and then study the diagrams that go with the text. A tremendous amount of legacy data exists in magazine and book form that has not been stored in electronic data form. This data could be used in a similar fashion by simply replacing the pagination process discussed above with a pagination process that uses no existing text data, and instead uses an optical character reader only to recover the text information from the images. If there are no image files, then they can easily be produced by scanning the original printed materials. These images could be stored in color format if color is important in the application.

While the present invention has been described in conjunction with a few specific embodiments identified in Figures 1 through 86, it will be apparent to those skilled in the art that many alternatives, modifications and variations in light of the foregoing description are possible. Accordingly, the 5 present invention is intended to embrace all such alternatives, modifications and variations as may fall within the spirit and scope of the invention as disclosed. Moreover, due to the limitations of a written black and white specification and drawings, the reader is referred to the video tape entitled "PatentWorks™", the PatentWorks™ Manual, and the computer program under 10 the same name, submitted with the filing of the parent application on which this patent is based. Since many of the features of the present invention involve dynamic events and the use of color, the viewing of the video tape, and use of the program, submitted to the United States Patent and Trademark Office is advised to thoroughly understand the nature of the present invention 15 as disclosed above.

***What Is Claimed Is:***

1. A method for generating an equivalent text file of a document from a source text file and a source image file comprising the steps of:

5 extracting a source text file and a source image file from at least one storage medium; and

paginating said source text file with said source image file of said document to produce an equivalent text file.

2. The method as defined by Claim 1 further including the step of:

10 displaying said equivalent text file and said source image file on a display.

3. The method as defined by Claim 1 further including the step of indexing said equivalent text file to generate an index of words in said source text file.

15 4. The method as defined by Claim 3 wherein said index of words comprises

a B+- inverted index.

5. The method as defined by Claim 3 wherein said equivalent text file includes a series of links which tie characters in said equivalent text file to locations in said source image file, such that data disposed in said equivalent text file may be displayed in a format similar in appearance to said source image file, when said equivalent text file is displayed on said display.

20 25 6. The method as defined by Claim 5 wherein said pagination step includes generation of an intermediate equivalent text file comprising an approximation of the formatting of said source image file from said source text file.

7. The method as defined by Claim 6 wherein said source image file comprises a plurality of bitmapped page images, said page images including characters comprised of contiguous pixels.

8. The method as defined by Claim 7 wherein said intermediate equivalent text file is generated by a method comprising the following steps:

storing each page of said source image file in a memory;

searching said plurality of bitmapped page images and identifying contiguous sets of pixels, each of said contiguous sets of pixels comprising a pixel cell;

10 copying each pixel cell into a bitmap buffer;

matching each of said pixel cells to a set of standard cells which represent ASCII characters, such that if a pixel cell matches a standard cell, then said pixel cell is referred to as a recognized pixel cell and labeled with the ASCII character represented by said standard cell; and

15 matching said recognized cell's ASCII labels with ASCII data comprising said source text file to paginate said recognized ASCII labels with said ASCII data.

9. The method as defined by Claim 6 wherein said intermediate equivalent text file is generated by a method comprising the following steps:

20 storing said source text file into a memory, said source text file including ASCII data records representing alphanumeric characters and logical group ID codes;

assigning each of said ASCII data records which begin with a bibliographic ID code an approximate location on a corresponding image page of said image file;

processing each of said ASCII data records to format said ASCII data records into paragraphs using a table of character widths and constant column lengths, and building a list of the locations of said logical group ID codes; and

saving said processed ASCII data records and said list of locations of said logical group ID codes.

10. The method as defined by Claim 9 further including the steps of:  
displaying said intermediate equivalent text file;  
5 displaying said source image file;  
comparing said intermediate equivalent text file to said source image file;  
adjusting the position of said ASCII characters comprising said paragraphs in said intermediate equivalent text file to match the appearance of  
10 said source image file, thereby creating said equivalent text file; and  
storing said equivalent text file.

11. The method as defined by Claim 1 wherein said source text file comprises  
an electronically stored ASCII text file.

15 12. The method as defined by Claim 11 wherein said image file is an electronically stored data file containing at least one image page from a source document.

13. The method as defined by Claim 12 wherein said image file is stored in Group 4 compressed format.

20 14. The method as defined by Claim 13 wherein said ASCII text file of said source text file comprises a data file in the format specified in the document  
"U.S. Patent and Trademark Office Patent Full-Text/APS File".

15. The method as defined by Claim 14 wherein said ASCII text file is stored in fixed length eighty character records, and wherein the last seventy five of the characters hold ASCII text data.

16. The method as defined by Claim 15 wherein in the event a ASCII text 5 file is longer than seventy-five characters, said ASCII text file is stored in multiple of said eighty character records.

17. The method as defined by Claim 12 wherein said equivalent text file is associated with a data file containing pagination information between said source text file and said source image file.

10 18. The method as defined by Claim 17 wherein said source text file comprises a PTO text file.

19. The method as defined by Claim 18 wherein said source image file comprises a PTO image file.

15 20. The method as defined by Claim 19 wherein said pagination information includes:

column information relating to the positions within said PTO text file of a first ASCII character of each patent text column displayed in said PTO image file;

20 line information relating to the positions within said PTO text file of a first ASCII character of each line of text displayed in said PTO image file;

column line number information including an approximate line number in a patent column that each line of ASCII text in said PTO text file is adjacent to; and

25 bibliographic formatting information including the arrangement of bibliographic data from said PTO text file as it appears on bibliographic images in said PTO image file.

21. The method as defined by Claim 20 wherein said pagination information further includes:

graphic item information identifying the locations in said PTO text file of graphics identified in said PTO text file; and

5 section information identifying positions within said PTO text file of logical sections of a patent document as displayed in said PTO image file.

22. The method as defined by Claim 21 wherein said pagination information further includes:

10 font information identifying a font style in which said ASCII characters in said PTO text file are displayed in said PTO image file;

point size information identifying a font size in which said ASCII characters in said PTO text file are displayed in said PTO image file;

15 superscript and subscript information identifying ASCII characters in said PTO text file are displayed in said PTO image file as having superscripts or subscripts; and

boldness information identifying the degree of boldness of said font style in which said ASCII characters in said PTO text file are displayed in said PTO image file.

20 23. The method as defined by Claim 22 wherein said pagination information further includes:

italic information identifying the degree of italicness of said font style of said ASCII characters of said PTO text file are displayed in said PTO image file;

25 special character information identifying which of said ASCII characters in said PTO text file are displayed in said PTO image file as special characters.

24. The method as defined by Claim 19 wherein said extraction step identifies which of a plurality of magnetic tapes said PTO text file and said

PTO image files are stored, and extracts said PTO text file and corresponding PTO image files and stores said PTO text file and corresponding PTO image files onto a second storage media.

25. An apparatus for generating an equivalent text file of a document from a source text file and a source image file comprising:

5 extraction means for extracting a source text file and a source image file from at least one storage medium; and

pagination means for paginating said source text file with said source image file of said document to produce an equivalent text file.

10 26. The apparatus of Claim 25 further comprising display means for displaying said equivalent text file and said source image file on a display.

27. The apparatus of Claim 25 further comprising index means for indexing said equivalent text file to generate an index of words in said source text file.

15 28. The apparatus of Claim 27 wherein said index of words comprises a B+- inverted index.

20 29. The apparatus of Claim 27 wherein said equivalent text file includes a series of links which tie characters in said equivalent text file to locations in said source image file, such that data disposed in said equivalent text file may be displayed in a format similar in appearance to said source image file, when said equivalent text file is displayed on said display.

25 30. The apparatus of Claim 29 wherein said pagination means includes file generation means for generating an intermediate equivalent text file comprising an approximation of the formatting of said source image file from said source text file.

31. The apparatus of Claim 30 wherein said source image file comprises a plurality of bitmapped page images, said page images including characters comprised of contiguous pixels.

5 32. The apparatus of Claim 31 wherein said file generation means for generating said intermediate equivalent text file comprises:

page storage means for storing each page of said source image file in a memory;

10 page image search means for searching said plurality of bitmapped page images and identifying contiguous sets of pixels, each of said contiguous sets of pixels comprising a pixel cell;

copy means for copying each pixel cell into a bitmap buffer;

15 pixel match means for matching each of said pixel cells to a set of standard cells which represent ASCII characters, such that if a pixel cell matches a standard cell, then said pixel cell is referred to as a recognized pixel cell and labeled with the ASCII character represented by said standard cell; and

label match means for matching said recognized cell's ASCII labels with ASCII data comprising said source text file to paginate said recognized ASCII labels with said ASCII data.

20 33. The apparatus of Claim 30 wherein said file generation means for generating said intermediate equivalent text file comprises:

text file storage means for storing said source text file into a memory, said source text file including ASCII data records representing alphanumeric characters and logical group ID codes;

25 assignment means for assigning each of said ASCII data records which bin with a bibliographic ID code an approximate location on a corresponding image page of said image file;

data process means for processing each of said ASCII data records to format said ASCII data records into paragraphs using a table of character

widths and constant column lengths, and building a list of the locations of said logical group ID codes; and

data save means for saving said processed ASCII data records and said list of locations of said logical group ID codes.

5 34. The apparatus of Claim 33 further comprising:

text file display means for displaying said intermediate equivalent text file;

image file display means for displaying said source image file;

text file comparison means for comparing said intermediate equivalent text file to said source image file;

position adjustment means for adjusting the position of said ASCII characters comprising said paragraphs in said intermediate equivalent text file to match the appearance of said source image file, thereby creating said equivalent text file; and

15 text file storage means for storing said equivalent text file.

35. The apparatus of Claim 25 wherein said source text file comprises an electronically stored ASCII text file.

36. The apparatus of Claim 35 wherein said image file is an electronically stored data file containing at least one image page from a source document.

20 37. The apparatus of Claim 36 wherein said image file is stored in Group 4 compressed format.

38. The apparatus of Claim 37 wherein said ASCII text file of said source text file comprises a data file in the format specified in the document "U.S. Patent and Trademark Office Patent Full-Text/APS File".

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39. The apparatus of Claim 38 wherein said ASCII text file is stored in fixed length eighty character records, and wherein the last seventy-five of the characters hold ASCII text data.

5 40. The apparatus of Claim 39 wherein in the event a ASCII text file is longer than seventy-five characters, said ASCII text file is stored in multiple of said eighty character records.

41. The apparatus of Claim 36 wherein said equivalent text file is associated with a data file containing pagination information between said source text file and said source image file.

10 42. The apparatus of Claim 41 wherein said source text file comprises a PTO text file.

43. The apparatus of Claim 42 wherein said source image file comprises a PTO image file.

15 44. The apparatus of Claim 43 wherein said pagination information includes:

column information relating to the positions within said PTO text file of a first ASCII character of each patent text column displayed in said PTO image file;

20 line information relating to the positions within said PTO text file of a first ASCII character of each line of text displayed in said PTO image file;

column line number information including an approximate line number in a patent column that each fine of ASCII text in said PTO text file is adjacent to; and

25 bibliographic formatting information including the arrangement of bibliographic data from said PTO text file as it appears on bibliographic images in said PTO image file.

45. The apparatus of Claim 44 wherein said pagination information further includes:

graphic item information identifying the locations in said PTO text file of graphics identified in said PTO text file; and

5 section information identifying positions within said PTO text file of logical sections of a patent document as displayed in said PTO image file.

46. The apparatus of Claim 45 wherein said pagination information further includes:

10 font information identifying a font style in which said ASCII characters in said PTO text file are displayed in said PTO image file;

point size information identifying a font size in which said ASCII characters in said PTO text file are displayed in said PTO image file;

15 superscript and subscript information identifying ASCII characters in said PTO text file are displayed in said PTO image file as having superscripts or subscripts; and

boldness information identifying the degree of boldness of said font style in which said ASCII characters in said PTO text file are displayed in said PTO image file.

47. The apparatus of Claim 46 wherein said pagination information further 20 includes:

italic information identifying the degree of italicness of said font style of said ASCII characters of said PTO text file are displayed in said PTO image file; and

25 special character information identifying which of said ASCII characters in said PTO text file are displayed in said PTO image file as special characters.

48. The apparatus of Claim 43 wherein said extraction means identifies which of a plurality of magnetic tapes said PTO text file and said PTO image

files are stored, and extracts said PTO text file and corresponding PTO image files and stores said PTO text file and corresponding PTO image files onto a second storage media.

49. A computer controlled display system including at least one central processing unit (CPU), said CPU coupled to a display for displaying text and images on said display, comprising:

5 storage means coupled to said CPU for storing at least one text document comprised of an equivalent text file, and at least one image document comprised of an image file stored in said storage means; and

10 a user interface generated by said CPU for display on said display, said user interface selectively displaying said equivalent text file and said image file on said display, such that said equivalent text file is displayed in a first window and said image file is displayed in a second window and both of said windows may be selectively viewed simultaneously on said display.

15 50. The display system as defined by Claim 49 wherein said first window is an equivalent text window, and said second window is an image window.

51. The display system as defined by Claim 50 further including text toolbox means coupled to said CPU and to said user interface for providing a first plurality of functions for operating on said equivalent text file.

20 52. The display system as defined by Claim 51 further including image toolbox means coupled to said CPU and to said user interface for providing a second plurality of functions for operating on said image file in said image window.

25 53. The display system as defined by Claim 52 further including synchronization means coupled to said CPU for selectively viewing said equivalent text file and said image file in a synchronized display.

54. The display system as defined by Claim 53 further including search means coupled to said CPU for permitting a user to search terms defined by a user in said equivalent text file.

5 55. The display system as defined by Claim 54 further including annotation means coupled to said CPU for generating and displaying at least one note window on said display to permit said user to insert text into said note window.

10 56. The display system as defined by Claim 55 wherein said note window is referenced to a selected portion of said equivalent text file displayed in said equivalent text window.

57. The display system as defined by Claim 56 wherein said annotation means provides a note window for each portion of said equivalent text file selected by said user.

15 58. The display system as defined by Claim 57 wherein said annotation means, upon selection by a user, displays a combined multiple note window, such that a single note window is referenced to multiple locations in said equivalent text file displayed in said equivalent text window.

20 59. The display system as defined by Claim 58 further including highlight means coupled to said CPU for permitting said user to highlight said selected portions of said equivalent text file displayed in said equivalent text window.

60. The display system as defined by Claim 59 wherein said combined multiple note window includes text related to multiple locations in said equivalent text file, each of said multiple locations of said equivalent text file being highlighted by said user.

61. The display system as defined by Claim 60 wherein said highlight means provides highlights in color on said display.

5 62. The display system as defined by Claim 61 wherein multiple highlights and corresponding note windows may be provided for the same portion of said equivalent text file displayed in said equivalent text window.

10 63. The display system as defined by Claim 53 wherein said storage means stores multiple equivalent text files and multiple image files.

15 64. The display system as defined by Claim 63 wherein said user interface selectively displays multiple equivalent text files in multiple equivalent text windows simultaneously on said display.

65. The display system as defined by Claim 64 wherein said user interface selectively displays multiple image files in multiple image windows simultaneously on said display.

20 15 66. A computer controlled display system including at least one central processing unit (CPU), said CPU coupled to a display for displaying an equivalent text of a patent document and a patent image on said display, comprising:

storage means coupled to said CPU for storing at least one patent document comprised of an equivalent text file, and at least one patent image document comprised of an image file stored in said storage means;

25 20 a user interface generated by said CPU for display by display means, said user interface selectively displaying said equivalent text file of said patent document and said image file on said display, such that said equivalent text file of said patent document is displayed in a first window and said image file is displayed in a second window and both of said windows may be selectively viewed simultaneously on said display.

67. The display system as defined by Claim 66 wherein said first window is an equivalent text window, and said second window is an image window..

68. The display system as defined by Claim 67 further including text toolbox means coupled to said CPU and to said user interface for providing a first plurality of functions for operating on said equivalent text file of said patent document.

69. The display system as defined by Claim 68 further including image toolbox means coupled to said CPU and to said user interface for providing a second plurality of functions for operating on said image file in said image window.

70. The display system as defined by Claim 69 further including synchronization means coupled to said CPU for selectively viewing said equivalent text file of said patent document and said image file in a synchronized display.

71. The display system as defined by Claim 70 further including search means coupled to said CPU for permitting a user to search terms defined by a user in said equivalent text file of said patent document.

72. The display system as defined by Claim 70 further including patent annotation means coupled to said CPU for generating and displaying at least one patent note window on said display to permit said user to insert text into said patent note window.

73. The display system as defined by Claim 72 wherein said patent note window is referenced to a selected portion of said equivalent text file of said patent document displayed in said equivalent text window.

74. The display system as defined by Claim 73 wherein said patent annotation means provides a patent note window for each portion of said equivalent text file selected by said user.

5 75. The display system as defined by Claim 74 wherein said patent annotation means, upon selection by a user, displays a combined multiple patent note window, such that a single patent note window is referenced to multiple locations in said equivalent text file displayed in said equivalent text window.

10 76. The display system as defined by Claim 75 wherein said storage means stores multiple equivalent text files and multiple image files.

77. The display system as defined by Claim 76 wherein a user may define a case including a plurality of said multiple equivalent text files and corresponding multiple image files.

15 78. The display system as defined by Claim 77 further including case annotation means coupled to said CPU for generating and displaying at least one case note window on said display to permit said user to insert text into said case note window.

20 79. The display system as defined by Claim 78 further including highlight means coupled to said CPU for permitting said user to highlight said selected portions of said equivalent text file displayed in said equivalent text window.

80. The display system as defined by Claim 79 wherein said highlight means provides highlights in color on said display.

81. The display system as defined by Claim 80 wherein multiple highlights and corresponding patent note windows may be provided for the same portion of said equivalent text file displayed in said equivalent text window.

5 82. The display system as defined by Claim 81 wherein said patent annotation means provides a visual indicator adjacent to said selected portions of said equivalent text file displayed in said equivalent text window, said visual indicator identifying said adjacent portion of said equivalent text file as having a corresponding patent note associated therewith.

10 83. The display system as defined by Claim 82 wherein said visual indicator is displayed in the same color as the highlight provided for the corresponding portion of said equivalent text file.

84. The display system as defined by Claim 83 wherein said visual indicator comprises a geometric shape.

15 85. The display system as defined by Claim 84 wherein upon the placement of a cursor over a portion of said display corresponding to said visual indicator and providing a signal to said CPU, to select said visual indicator, said patent annotation means displays the patent note window corresponding to said selected visual indicator.

20 86. The display system as defined by Claim 77 wherein upon selection by said user, said user interface displays multiple equivalent text files in multiple equivalent text windows simultaneously on said display.

87. The display system as defined by Claim 86 wherein upon selection by said user, said user interface selectively displays multiple image files in multiple image windows simultaneously, on said display.

88. The display system as defined by Claim 87 wherein said synchronization means includes column information to synchronize said equivalent text file to said image file.

5 89. The display system as defined by Claim 88 wherein said equivalent text window includes column increment/decrement means for selectively incrementing and decrementing columns of said equivalent text file displayed on said display.

10 90. The display system as defined by Claim 89 wherein said user interface displays a Patent Text Toolbox window, said Patent Text Toolbox window including:

highlight selection means for selecting one of a plurality of highlight colors;

15 patent section navigation means for selecting a section of said equivalent text file, said selection of said section resulting in said CPU displaying said section of said equivalent text file in said equivalent text window.

20 91. The display system as defined by Claim 71 wherein said search means displays search results in a search result window, said search result window including a listing of all equivalent text files which include a search term defined by said user.

92. The display system as defined by Claim 91 wherein said search result window includes a numeric count of instances where said search term defined by said user was located for each of said equivalent text files in said listing in said search result window.

25 93. The display system as defined by Claim 92 further including search result scroll means for scrolling either up and down said listing of said

equivalent text files and search result view means for viewing a different part of said listing of said equivalent text files in said search result window.

94. The display system as defined by Claim 93 further including file display means for opening one of said equivalent text files in said search result window and displaying said equivalent text file in said equivalent text window.

5 95. The display system as defined by Claim 94 further including select-all means for selecting all of said equivalent text files and closing means for closing said search result window.

10 96. The display system as defined by Claim 91 wherein said search means displays a search process in a search library window, said search library window including a search item window in which said user defines search terms.

97. The display system as defined by Claim 96 further including subset selection means for selecting a subset of all of said equivalent text files.

15 98. The display system as defined by Claim 97 wherein said subset selection means includes selecting a subset of a main library, selecting a current library and selecting a subset of all of said equivalent text files.

20 99. The display system as defined by Claim 98 further including connector word display means for invoking connector words and clearing means for clearing said search terms displayed in said search item window.

100. The display system as defined by Claim 98 further including save-search means for saving said search terms and get-search means for retrieving previously saved search terms.

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101. The display system as defined by Claim 98 further including search-start means for initiating a search for said search terms and cancellation means for stopping said search for said search terms.

102. The display system as defined by Claim 98 further including search library

5 scroll means for scrolling either up and down said search item window.

103. The display system as defined by Claim 98 wherein said search means includes a word list window, said word list window including a plurality of subword list windows.

10 104. The display system as defined by Claim 103 wherein said sub-word list windows include listings of all words that appear in an equivalent text file selected by said user.

15 105. The display system as defined by Claim 104 further including index means for indexing each sub-word list window alphabetically and word display means for displaying sorted said words.

106. The display system as defined by Claim 105 wherein said index means includes tagging each sub-word list window with an alphabet, and each sub-word list window displays said words with the same prefix as said alphabet of said sub-word list window.

20 107. The display system as defined by Claim 106 wherein each sub-word list window includes, for each of said words, a numeric count of instances where each of said words occurs in said equivalent text file.

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108. The display system as defined by Claim 107 further including key word selection means for selecting a word from any of said sub-word list windows and adding said word to said search item window.

5 109. The display system as defined by Claim 104 further including sub-word list window scroll means for scrolling either up and down a sub-word list window and sub-word list window view means for viewing a different part of said listing of said words in a sub-word list window.

10 110. The display system as defined by Claim 69 wherein said image toolbox means includes a rotation function for rotating said patent image document displayed in said image window.

111. The display system as defined by Claim 110 wherein said image toolbox means includes a select element number function for displaying a portion of an equivalent text file associated with a select element number.

15 112. The display system as defined by Claim 111 wherein said select element number function includes activating an icon for displaying an select element number window, inputting said select element number, activating a find-in-text icon and displaying said portion of said equivalent text file beginning at a first occurrence of said select element number.

20 113. The display system as defined by Claim 69 further including image enlargement means for enlarging a portion of said image file displayed in said image window.

114. The display system as defined by Claim 113 wherein said image enlargement means include outlining a box around a portion of said image file displayed in said image window, enlarging said portion of said image file

disposed within said box, and displaying said enlarged image of said portion of said image file in said image window.

115. In a computer controlled display system including at least one central processing unit (CPU), said CPU coupled to a display, a display method for displaying text and images on said display, comprising the steps of:

5                   storing, in a storage means coupled to said CPU, at least one text document comprised of an equivalent text file, and at least one image document comprised of an image file stored in said storage means;

10                  generating a user interface using said CPU for display on said display; and

15                  selectively displaying said equivalent text file and said image file on said display using said user interface, such that said equivalent text file is displayed in a first window and said image file is displayed in a second window and both of said windows may be selectively viewed simultaneously on said display.

116. The display method as defined by Claim 115 wherein said first window is an equivalent text window, and said second window is an image window.

117. The display method as defined by Claim 116 further including the step of providing a first plurality of functions for operating on said equivalent text file.

20                  118. The display method as defined by Claim 117 further including the step of providing a second plurality of functions for operating on said image file in said image window.

25                  119. The display method as defined by Claim 118 further including the step of selectively viewing said equivalent text file and said image file in a synchronized display.

120. The display method as defined by Claim 119 further including the step of permitting a user to search terms defined by a user in said equivalent text file.

121. The display method as defined by Claim 120 further including the step of generating and displaying, using annotation means coupled to said CPU, at least one note window on said display to permit said user to insert text into said note window.

5 122. The display method as defined by Claim 121 wherein said note window is referenced to a selected portion of said equivalent text file displayed in said

10 equivalent text window.

123. The display method as defined by Claim 122 wherein said annotation means provides a note window for each portion of said equivalent text file selected by said user.

15 124. The display method as defined by Claim 123 wherein said annotation means, upon selection by a user, displays a combined multiple note window, such that a single note window is referenced to multiple locations in said equivalent text file displayed in said equivalent text window.

20 125. The display method as defined by Claim 124 further including highlight

means coupled to said CPU for permitting said user to highlight said selected

portions of said equivalent text file displayed in said equivalent text.

126. The display method as defined by Claim 125 wherein said combined multiple note window includes text related to multiple locations in said equivalent text file, each of said multiple locations of said equivalent text file being highlighted by said user.

127. The display method as defined by Claim 126 wherein said highlight means provides highlights in color on said display.

128. The display method as defined by Claim 127 wherein multiple highlights and corresponding note windows may be provided for the same portion of said equivalent text file displayed in said equivalent text window.

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129. The display method as defined by Claim 119 wherein said storage means stores multiple equivalent text files and multiple image files.

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130. The display method as defined by Claim 129 wherein said user interface selectively displays multiple equivalent text files in multiple equivalent text windows simultaneously on said display.

131. The display method as defined by Claim 130 wherein said user interface selectively displays multiple image files in multiple image windows simultaneously on said display.

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132. In a computer controlled display system including at least one central processing unit (CPU), said CPU coupled to a display, a display method for displaying an equivalent text of a patent document and a patent image on said display, comprising:

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storing, in a storage means coupled to said CPU, at least one patent document comprised of an equivalent text file, and at least one patent image document comprised of an image file stored in said storage means;

25

generating a user interface using said CPU for display on said display; selectively displaying said equivalent text file of said patent document and said image file on said display, such that said equivalent text file of said patent document is displayed in a first text window and said image file is displayed in a second window and both of said windows may be selectively viewed simultaneously on said display.

133. The display method as defined by Claim 132 wherein said first window is an equivalent text window, and said second window is an image window.

134. The display method as defined by Claim 133 further including the step of providing a first plurality of functions for operating on said equivalent text file of said patent document.

5 135. The display method as defined by Claim 134 further including the step of providing a second plurality of functions for operating on said image file in said image window using image toolbox means.

10 136. The display method as defined by Claim 135 further including the step of synchronizing and selectively viewing said equivalent text file of said patent document and said image file in a synchronized display, such that said equivalent text file is synchronized to said image file.

15 137. The display method as defined by Claim 136 further including the step of a user searching terms defined by said user in said equivalent text file of said patent document using search means coupled to said CPU.

138. The display method as defined by Claim 137 further including the step of generating and displaying at least one patent note window on said display to permit said user to insert text into said patent note window, using patent annotation means coupled to said CPU.

20 139. The display method as defined by Claim 138 wherein said patent note window is referenced to a selected portion of said equivalent text file of said patent document displayed in said equivalent text window.

140. The display method as defined by Claim 139 wherein said patent annotation means provides a patent note window for each portion of said equivalent text file selected by said user.

5 141. The display method as defined by Claim 140 wherein said patent annotation means, upon selection by a user, displays a combined multiple patent note window, such that a single patent note window is referenced to multiple locations in said equivalent text file displayed in said equivalent text window.

10 142. The display method as defined by Claim 141 wherein said storage means stores multiple equivalent text files and multiple image files.

143. The display method as defined by Claim 142 wherein a user may define a case including a plurality of said multiple equivalent text files and corresponding multiple image files.

15 144. The display method as defined by Claim 143 further including the step of generating and displaying at least one case note window on said display to permit said user to insert text into said case note window using case annotation means coupled to said CPU.

20 145. The display method as defined by Claim 144 further including the step of permitting said user to highlight said selected portions of equivalent text file displayed in said equivalent text window, using highlight means coupled to said CPU.

146. The display method as defined by Claim 145 wherein said highlight means provides highlights in color on said display.

147. The display method as defined by Claim 146 wherein multiple highlights and corresponding patent note windows may be provided for the same portion of said equivalent text file displayed in said equivalent text window.

5 148. The display method as defined by Claim 147 wherein said patent annotation means provides a visual indicator adjacent to said selected portions of said equivalent text file displayed in said equivalent text window, said visual indicator identifying said adjacent portion of said equivalent text file as having a corresponding patent note associated therewith.

10 149. The display method as defined by Claim 148 wherein said visual indicator is displayed in the same color as the highlight provided for the corresponding portion of said equivalent text file.

150. The display method as defined by Claim 149 wherein said visual indicator comprises a geometric shape.

15 151. The display method as defined by Claim 150 wherein upon the placement of a cursor over a portion of said display corresponding to said visual indicator and providing a signal to said CPU, to select said visual indicator, said patent annotation means displays the patent note window corresponding to said selected visual indicator.

20 152. The display method as defined by Claim 143 wherein upon selection by said user, said user interface displays multiple equivalent text files in multiple equivalent text windows simultaneously on said display.

25 153. The display method as defined by Claim 152 wherein upon selection by said user, said user interface selectively displays multiple image files in multiple image windows simultaneously on said display.

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154. The display method as defined by Claim 132 wherein said synchronizing step provides column information to synchronize said equivalent text file to said patent image file.

5 155. The display method as defined by Claim 154 further including the step of selectively incrementing and decrementing columns of said equivalent text file displayed on said display.

10 156. The display method as defined by Claim 145 further including the step of said user interface displaying a Patent Text Toolbox window, said Patent Text Toolbox window including:

15 highlight selection means for selecting one of a plurality of highlight colors;

15 highlight selection means for selecting a section of said equivalent text file, said selection of said section resulting in said CPU displaying said section of said equivalent text file in said equivalent text window.

157. The display method as defined by Claim 137 wherein the step of searching terms includes displaying search results in a search result window, said search result window including a listing of all equivalent text files which include a search term defined by said user.

20 158. The display method as defined by Claim 152 wherein said search result window includes a numeric count of instances where said search term defined by said user was located for each of said equivalent text files in said listing in said search result window.

25 159. The display method as defined by Claim 158 further including the steps of scrolling either up and down said listing of said equivalent text files and

viewing a different part of said listing of said equivalent text files in said search result window.

160. The display method as defined by Claim 159 further including the steps of opening one of said equivalent text files in said search result window and displaying said equivalent text file in said equivalent text window.

5 161. The display method as defined by Claim 160 further including the steps of selecting all of said equivalent text files and closing said search result window.

10 162. The display method as defined by Claim 157 further including the step of displaying a search process in a search library window, said search library window including a search item window in which said user defines search terms.

163. The display method as defined by Claim 162 further including the step of selecting a subset of all of said equivalent text files.

15 164. The display method as defined by Claim 163 wherein the step of selecting said subset includes one of selecting a subset of a main library, selecting a current library and selecting a subset of all of said equivalent text files.

20 165. The display method as defined by Claim 162 further including the step of invoking connector words and clearing said search terms displayed in said search item window.

166. The display method as defined by Claim 162 further including the step of saving said search terms and retrieving previously saved search terms.

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167. The display method as defined by Claim 162 further including the steps of initiating a search for said search terms and stopping said search for said search terms.

5 168. The display method as defined by Claim 162 further including the step of scrolling either up and down said search item window.

169. The display method as defined by Claim 162 wherein the step of displaying said search process includes displaying a word list window, said word list window including a plurality of sub-word list windows.

10 170. The display method as defined by Claim 169 wherein said sub-word list windows include listings of all words that appear in an equivalent text file selected by said user.

171. The display method as defined by Claim 170 further including the steps of indexing each sub-word list window alphabetically and displaying sorted said words.

15 172. The display method as defined by Claim 171 wherein the indexing step includes the step of tagging each sub-word list window with an alphabet and the step of each sub-word list window displaying said words with the same prefix as said alphabet of said sub-word list window.

20 173. The display method as defined by Claim 172 wherein each sub-word list window includes, for each of said words, a numeric count of instances where each of said words occurs in said equivalent text file.

174. The display method as defined by Claim 171 further including the steps of selecting a word from any of said sub-word list windows and adding said word to said search item window.

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175. The display method as defined by Claim 171 further including the steps of scrolling either up and down a sub-word list window and viewing a different part of said listing of said words in a sub-word list window.

5 176. The display method as defined by Claim 135 further including the step of rotating said image file displayed in said image window.

177. The display method as defined by Claim 176 further including the step of displaying a portion of an equivalent text file associated with a select element number.

10 178. The display method as defined by Claim 177 wherein the step of displaying said portion of said equivalent text file associated with said select element number includes the steps of activating an icon for displaying a select element number window, inputting said select element number, activating a find-in-text icon and displaying said portion of said equivalent text file beginning at a first occurrence of said select element number.

15 179. The display method as defined by Claim 139 further including the step of enlarging a portion of said image file displayed in said image window.

20 180. The display method as defined by Claim 179 wherein the step of enlarging said portion of said image file include the steps of outlining a box around a portion of said image file displayed in said image window, enlarging said portion of said image file disposed said box, and displaying said enlarged image of said portion of said image file in said image window.

181. A computer controlled display system, comprising:  
a central processing unit (CPU);  
a display unit;

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a storage device for storing at least one text document comprised of an equivalent text file, and at least one image document comprised of a compressed image file; and

5 a user interface generated by said CPU for display on said display unit, said user interface displaying said text document in a first window of said display unit and said image document in a second window of said display unit.

182. The display system of claim 181, wherein said user interface comprises:

10 means for enabling an operator to select a "zoom image" option to zoom a user-selected portion of said image document in said second window of said display unit;

means for enabling said operator to enter a zoom level once said "zoom image" option has been selected;

15 a data decompressor for decompressing a portion of said compressed image file corresponding to said user-selected portion of said image document in accordance with said zoom level; and

means for displaying a zoomed image represented by said decompressed image file in said second window of said display unit.

20 183. The display system of claim 182, wherein said user-selected portion of said image document represents all of said image document.

184. The display system of claim 182, wherein said user interface supports a first zoom level and a second zoom level, a magnification and resolution of said second zoom level being equal to  $1/N$ th a magnification and resolution of said first zoom level.

25 185. The display system of claim 184, wherein said data decompressor comprises:

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means for decompressing every bit in every line of said portion of said compressed image file when said operator enters said first zoom level; and

means for decompressing every Nth bit in every Nth line of said portion of said compressed image file when said operator enters said second zoom level.

186. The display system of claim 181, wherein said user interface comprises:

means for enabling an operator to select a "copy image" option to copy a user-selected portion of said image document to a user-specified destination;

means for enabling said operator to enter a resolution level once said "copy image" option has been selected;

15 a data decompressor for decompressing a portion of said compressed image file corresponding to said user-selected portion of said image document in accordance with said resolution level; and

means for copying said decompressed portion of said compressed image file to said user-specified destination.

187. The display system of claim 186, wherein said user-specified destination is a user-accessible buffer.

188. The display system of claim 186, wherein said user-specified destination is a user-specified file.

189. The display system of claim 181, wherein said user interface comprises:

25 means for enabling an operator to select a "lock windows" option; and

means for disabling movement of all windows displayed on said display unit when said "lock windows" option has been selected.

190. The display system of claim 181, wherein said text document and said image document constitute representations of a patent document.

5 191. The display system of claim 190, wherein said user interface comprises:

means for enabling an operator to select a "copy claims" option to copy a claims section of said text document to a user-specified destination;

locating means for locating a beginning of said claims section in said text document;

means for extracting from said text document all text following said beginning of said claims section; and

means for copying said extracted text to said user-specified destination.

15 192. The display system of claim 191, wherein said user-specified destination is a user-accessible buffer.

193. The display system of claim 191, wherein said user-specified destination is a user-specified file.

194. The display system of claim 191, further comprising:

20 means for maintaining a linked list comprising a plurality of records, each record corresponding to a section in said text document and including a pointer that points to a beginning of said section;

wherein said locating means comprises:

means for locating a last record in said linked list; and

25 means for using a pointer contained in said last record to locate said beginning of said claims section in said text document.

195. In a computer controlled display system comprising a central processing unit (CPU) and a display unit, a display method for displaying text and images on said display unit, comprising the steps of:

(1) storing, in a storage unit coupled to said CPU, at least one text document comprised of an equivalent text file, and at least one image document comprised of a compressed image file;

(2) generating a user interface using said CPU for display on said display unit; and

10 (3) displaying said text document in a first window of said display unit and said image document in a second window of said display unit.

196. The display method of claim 195, further comprising the steps of:

(a) enabling an operator to select a "zoom image" option to zoom a user-selected portion of said image document in said second window of said display unit;

15 (b) enabling said operator to enter a zoom level once said "zoom image" option has been selected;

(c) decompressing a portion of said compressed image file corresponding to said user-selected portion of said image document in accordance with said zoom level; and

20 (d) displaying a zoomed image represented by said decompressed image file in said second window of said display unit.

197. The display method of claim 196, wherein said user-selected portion of said image document represents all of said image document.

25 198. The display method of claim 196, wherein a first zoom level and a second zoom level are supported, a magnification and resolution of said second zoom level being equal to 1/Nth a magnification and resolution of said first zoom level.

199. The display method of claim 198, wherein step (c) comprises the steps of:

decompressing every bit in every line of said portion of said compressed image file when said operator enters said first zoom level; and

5 decompressing every Nth bit in every Nth line of said portion of said compressed image file when said operator enters said second zoom level.

200. The display method of claim 195, further comprising the steps of:

10 enabling an operator to select a "copy image" option to copy a user-selected portion of said image document to a user-specified destination;

enabling said operator to enter a resolution level once said "copy image" option has been selected;

15 decompressing a portion of said compressed image file corresponding to said user-selected portion of said image document in accordance with said resolution level; and

copying said decompressed portion of said compressed image file to said user-specified destination.

201. The display method of claim 200, wherein said user-specified destination is a user-accessible buffer.

202. The display method of claim 200, wherein said user-specified destination is a user-specified file.

203. The display method of claim 195, further comprising the steps of:

enabling an operator to select a "lock windows" option; and

25 disabling movement of all windows displayed on said display unit when said "lock windows" option has been selected.

204. The display method of claim 195, wherein said text document and said image document constitute representations of a patent document.

205. The display method of claim 204, further comprising the steps of:

5 (a) enabling an operator to select a "copy claims" option to copy a claims section of said text document to a user-specified destination;

(b) locating a beginning of said claims section in said text document;

(c) extracting from said text document all text following said beginning of said claims section; and

10 (d) copying said extracted text to said user-specified destination.

206. The display method of claim 205, wherein said user-specified destination is a user-accessible buffer.

15 207. The display method of claim 205, wherein said user-specified destination is a user-specified file.

208. The display method of claim 205, further comprising the steps of:

5 maintaining a linked list comprising a plurality of records, each record corresponding to a section in said text document and including a pointer that points to a beginning of said section;

15 20 wherein step (b) comprises the steps of:

locating a last record in said linked list; and

20 using a pointer contained in said last record to locate said beginning of said claims section in said text document.

209. A computer system, comprising:

a first client machine;

5 a second client machine comprising a shared disk drive, file rename operations being atomic operations in said shared disk drive, said shared disk drive being accessible to both said first and second client machines;

said first client machine including:

means for writing a command file to said shared disk drive, said command file having a file name with a first file name extension;

10 means for renaming said command file to a file name with a second file name extension after said command file has been completely written to said shared disk drive;

said second client machine including:

15 means for retrieving from said shared disk drive any command files having file names with said second file name extension; and

means for executing said retrieved command files.

210. The computer system of claim 209, wherein said second client machine is a UNIX based machine.

20 211. A method of generating an equivalent text file of a document from a source text file and a source image file, comprising the steps of:

(1) extracting said source text file and said source image file from at least one storage medium, said source text file and said source image file constituting representations of said document; and

25 (2) paginating said source text file with said source image file according to a user-specified synchronization level to produce an equivalent text file.

212. The method of claim 211, wherein step (2) comprises the step of:  
5 paginating said source text file with said source image file at a  
page basis to produce said equivalent text file.

213. The method of claim 211, wherein step (2) comprises the step of:  
10 paginating said source text file with said source image file at a  
page and column basis to produce said equivalent text file.

214. The method of claim 211, wherein step (2) comprises the step of:  
15 paginating said source text file with said source image file at a  
page, column, and line basis to produce said equivalent text file.

215. The method of claim 211 in which said source image file is  
20 compressed, wherein step (2) comprises the steps of:  
identifying clumps in said compressed source image file;  
comparing said clumps to character templates to recognize said  
clumps as characters;

25 identifying lines of said characters; and  
matching said source text file with said lines of characters in  
said compressed source image file to associated end of lines, end of columns,  
and end of pages with characters in said source text file;  
wherein said source text file having associated therewith end of lines,  
end of columns, and end of pages represents said equivalent text file.

216. A computer based apparatus for generating an equivalent text file of  
25 a document from a source text file and a source image file, comprising:  
means for extracting said source text file and said source image  
file from at least one storage medium, said source text file and said source  
image file constituting representations of said document; and

-120-

pagination means for paginating said source text file with said source image file according to a user-specified synchronization level to produce an equivalent text file.

5 217. The apparatus of claim 216, wherein said pagination means paginates said source text file with said source image file at a page basis to produce said equivalent text file.

218. The apparatus of claim 216, wherein said pagination means paginates said source text file with said source image file at a page and column basis to produce said equivalent text file.

10 219. The apparatus of claim 216, wherein said pagination means paginates said source text file with said source image file at a page, column, and line basis to produce said equivalent text file.

220. The apparatus of claim 216 in which said source image file is compressed, wherein said pagination means comprises:

15 means for identifying clumps in said compressed source image file;

means for comparing said clumps to character templates to recognize said clumps as characters;

means for identifying lines of said characters; and

20 means for matching said source text file with said lines of characters in said compressed source image file to associated end of lines, end of columns, and end of pages with characters in said source text file;

wherein said source text file having associated therewith end of lines, end of columns, and end of pages represents said equivalent text file.

221. A computer system, comprising:  
a central processing unit (CPU);  
a display unit;  
a controller for enabling said CPU to cause said display unit to display  
text and images, comprising:

means for enabling said CPU to store at least one text document  
comprised of an equivalent text file, and at least one image document  
comprised of a compressed image file;

means for enabling said CPU to generate a user interface for  
display on said display unit; and

means for enabling said CPU to display said text document in  
a first window of said display unit and said image document in a second  
window of said display unit.

222. A controller to enable a processor to cause a display unit to display  
text and images, the controller comprising:

means for enabling said processor to store at least one text document  
comprised of an equivalent text file, and at least one image document  
comprised of a compressed image file;

means for enabling said processor to generate a user interface for  
display on said display unit; and

means for enabling said processor to display said text document in a  
first window of said display unit and said image document in a second window  
of said display unit.

223. A computer system, comprising:

a processor;

a controller for enabling said processor to generate an equivalent text  
file of a document from a source text file and a source image file, comprising:

means for enabling said processor to extract said source text file  
and said source image file from at least one storage medium, said source text

-122-

file and said source image file constituting representations of said document; and

means for enabling said processor to paginate said source text file with said source image file according to a user-specified synchronization level to produce an equivalent text file.

224. A controller for enabling a processor to generate an equivalent text file of a document from a source text file and a source image file, comprising:

means for enabling said processor to extract said source text file and said source image file from at least one storage medium, said source text file and said source image file constituting representations of said document; and

means for enabling said processor to paginate said source text file with said source image file according to a user-specified synchronization level to produce an equivalent text file.

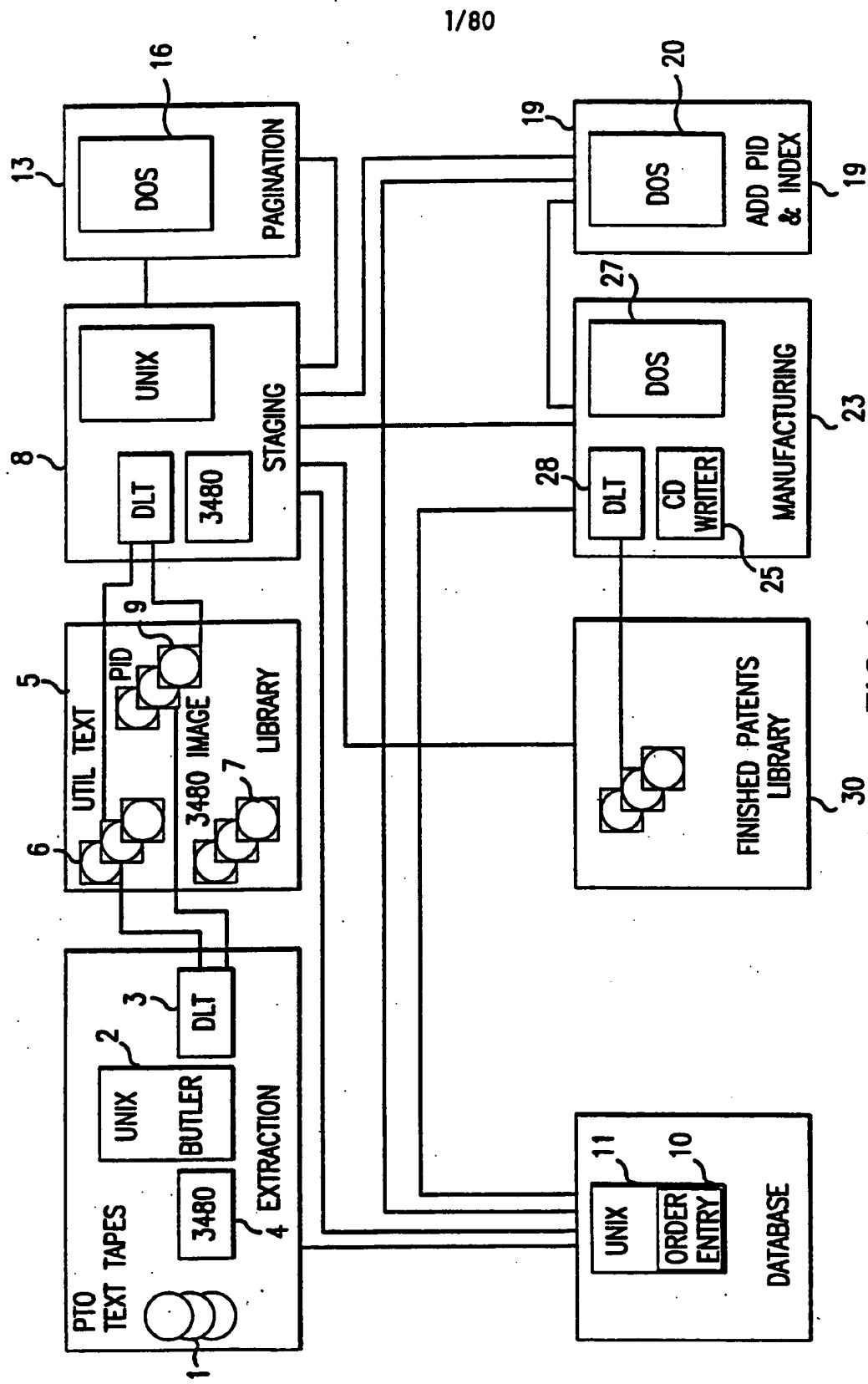


FIG. 1

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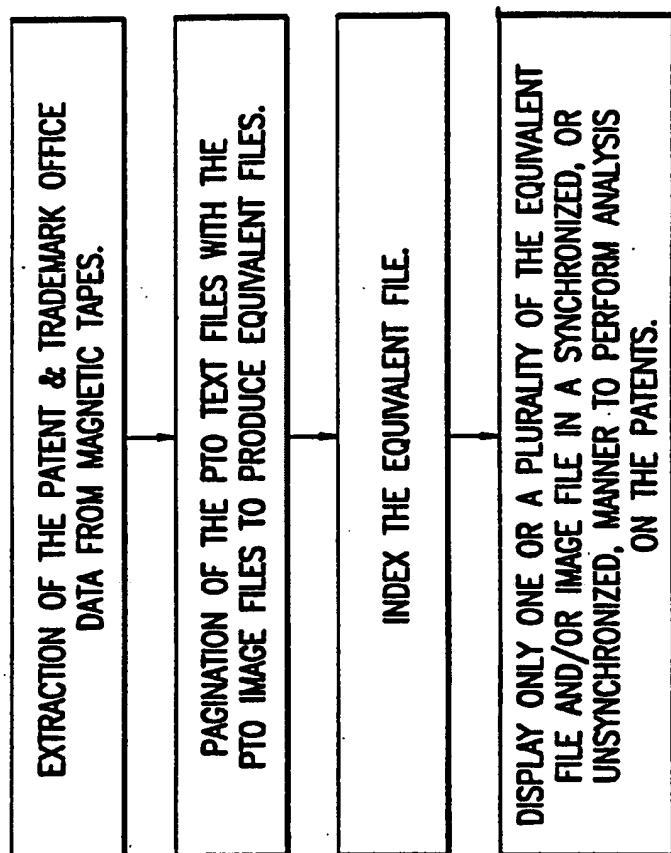


FIG.2

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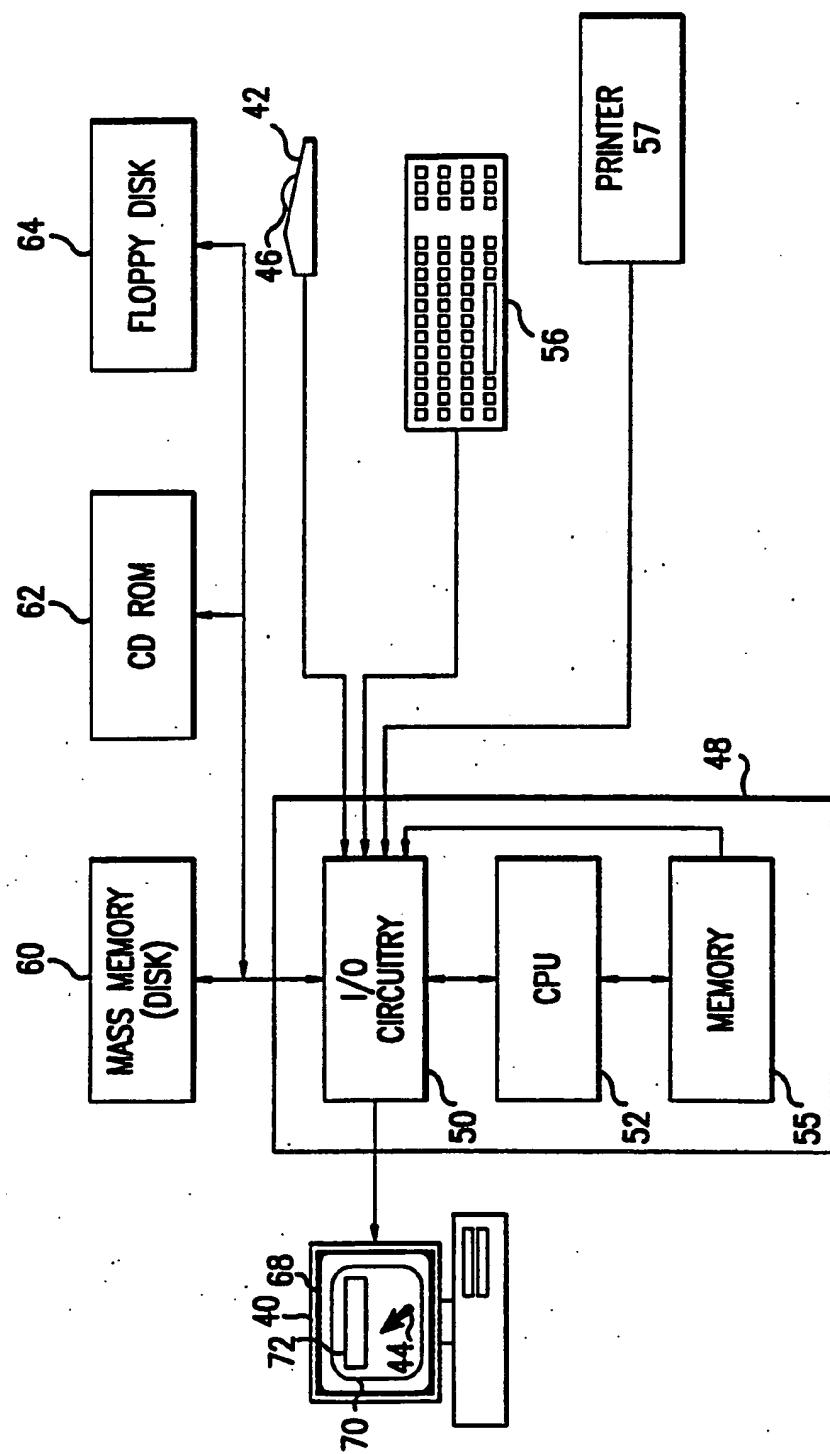


FIG.3

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United States Patents [19]  
Krauskopf

[54] MICROPROCESSOR BREAKPOINT  
APPARATUS

[75] Inventor: Joseph C. Krauskopf, Santa Clar  
Calif.

[73] Assignee: Intel Corporation, Santa Clara,

[\*] Notice: The portion of the term of thi

FIG.4

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| PATN | WKU | 051650274                           |
|      | SRC | 7                                   |
|      | APN | 7036760                             |
|      | APT | 1                                   |
|      | ART | 237                                 |
|      | APD | 19910520                            |
|      | TTL | Microprocessor breakpoint apparatus |
|      | ISD | 19921117                            |
|      | NCL | 16                                  |
|      | ECL | 1                                   |
|      | EXA | Tung; Kee M.                        |
|      | EXP | Show; Dale M.                       |
|      | NDR | 3                                   |
|      | NFG | 5                                   |
|      | DCD | 20060822                            |

BSUM  
PAC  
PAR 1. Field of the Invention  
PAR The invention relates to the field of hardware implemented breakpoints for computer programs, primarily used for analyzing or "debugging" programs.

PAR  
PAR

Numerous techniques are used to analyze the performance of computer programs, particularly during their development. This is often referred to as "debugging". The debugging process is recognized as a significant part of the development of a computer program, and in some cases, the time required for debugging exceeds that required to write the program.

FIG.5

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**PAR** Numerous techniques are used to analyze the performance of computer programs, particularly during their development. This is often referred to as "debugging". The debugging process is recognized as a significant part of the development of a computer program, and in some cases, the time required for debugging exceeds that required to write the program.

**FIG. 6**

Numerous techniques are used to analyze the performance of computer programs, particularly during their development. This is often referred to as "debugging". The debugging process is recognized as a significant part of the development of a computer program, and in some cases, the time required for debugging exceeds that required to write the program.

**FIG. 7**

5,165,027

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## MICROPROCESSOR BREAKPOINT APPARATUS

This application is a continuation of application Ser. No. 07/593,399 filed Oct 3, 1990, now U.S. Pat. No. 5,053,944, which was a continuation of application Ser. No. 07/370,024 filed Jun. 22, 1989 now abandoned, which was a continuation of application Ser. No. 07/274,636 filed Nov. 15, 1988, now U.S. Pat. No. 4,860,195, which was a continuation of application Ser. No. 06/822,263 filed Jan. 24, 1986, now abandoned.

2

data, a virtual address bus, address translation means for converting the virtual address on the bus to a physical address, interpretation means for interpreting the program instructions, and arithmetic means for operating upon the data in accordance with the interpreted instructions. The apparatus includes a first register for storing a predetermined address in the form of a virtual address at which a breakpoint is to occur. A second register is used for storing control bits which permit the user to select certain conditions of the breakpoint such as whether the breakpoint is to occur at a reference to computer program or data. A comparator means compares the predetermined virtual address with the address generated by the computer (current virtual address). A first logic means determines if the current virtual address is a reference to program instructions or data by examining address control signals. This logic means is also controlled by the control bits stored in the second register. Gating means used to provide the 15 20 breakpoint signal and interrupt the operation of the computer is coupled to the output of the comparator means and the first logic means. The entire apparatus is formed on the same substrate with the microprocessor. The apparatus also includes second logic means to determine if the current virtual address

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The invention relates to the field of hardware implemented breakpoints for computer programs, primarily used for analyzing or 'debugging' programs.

### 2. Prior Art

Numerous techniques are used to analyze the performance of computer programs, particularly during their development. This is often referred to as "debugging". The debugging process is recognized as a significant part of the development of a computer program, and in some cases, the time required for debugging exceeds that required to write the program. 25

FIG. 8

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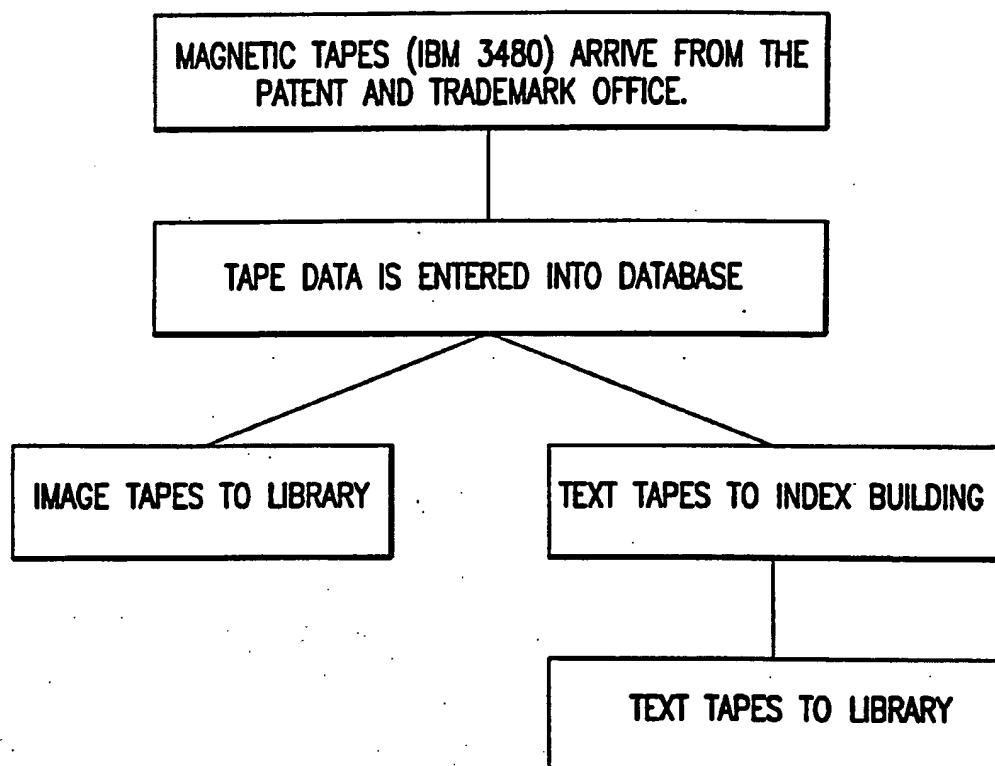


FIG.9

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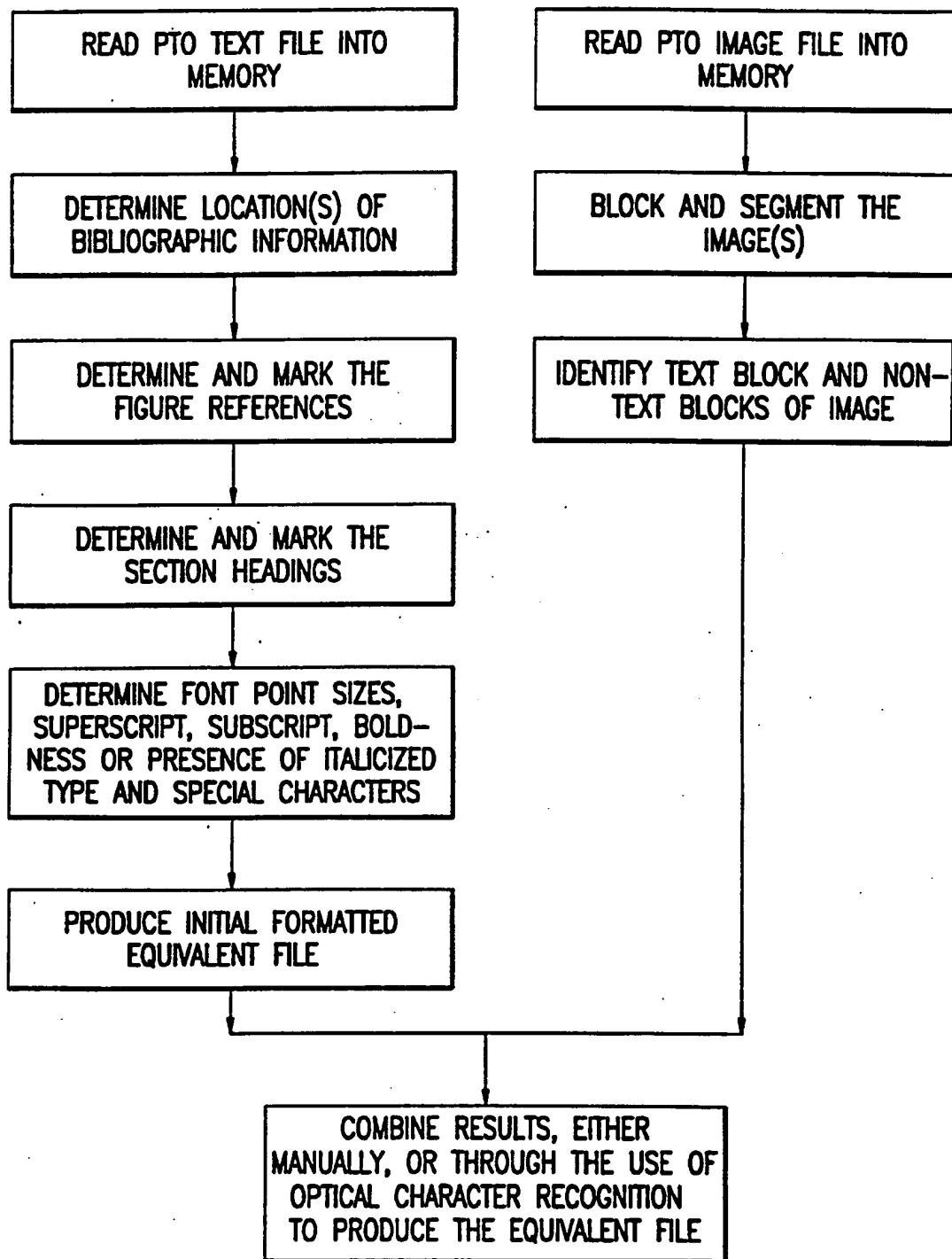
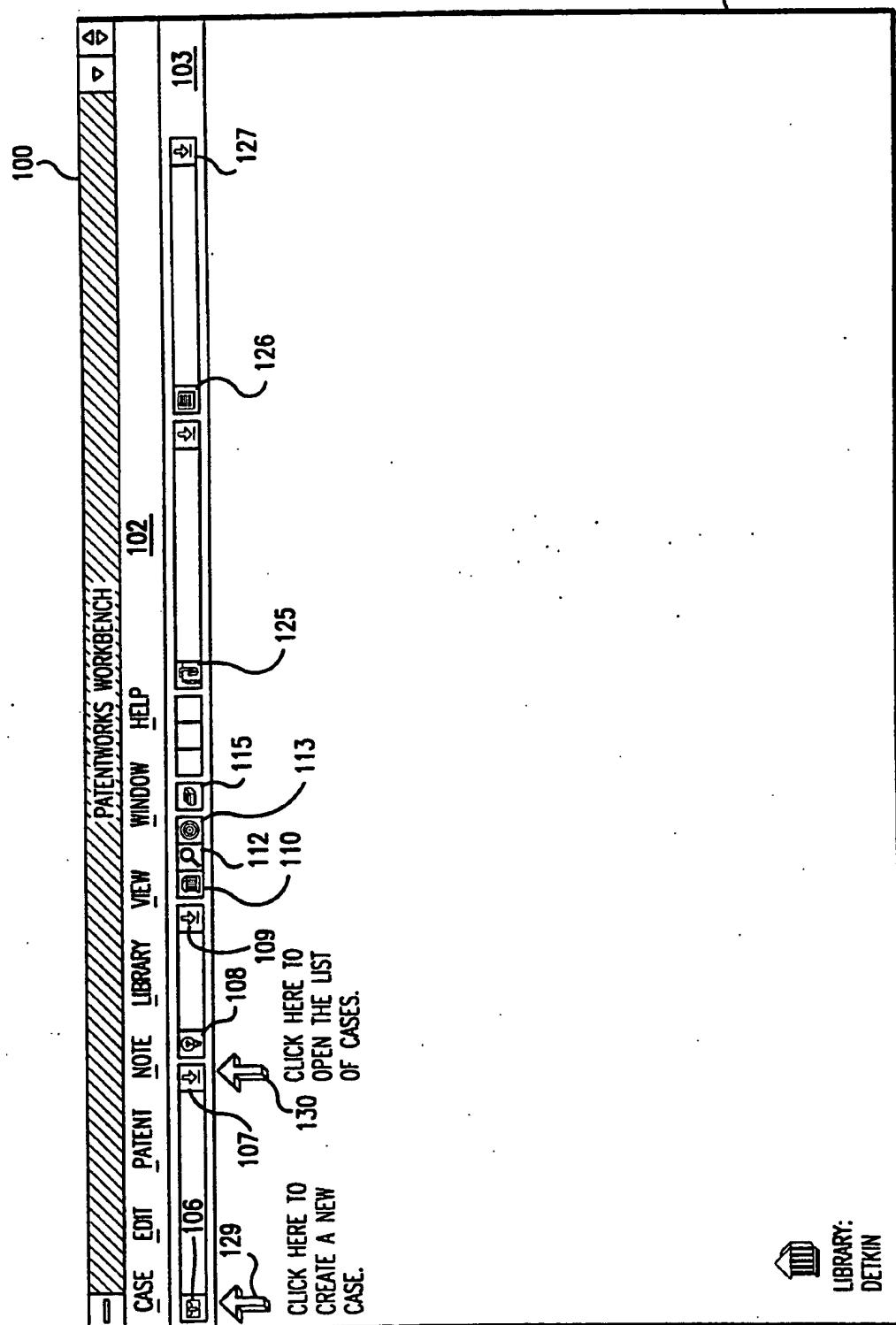


FIG.10

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**FIG. 1**

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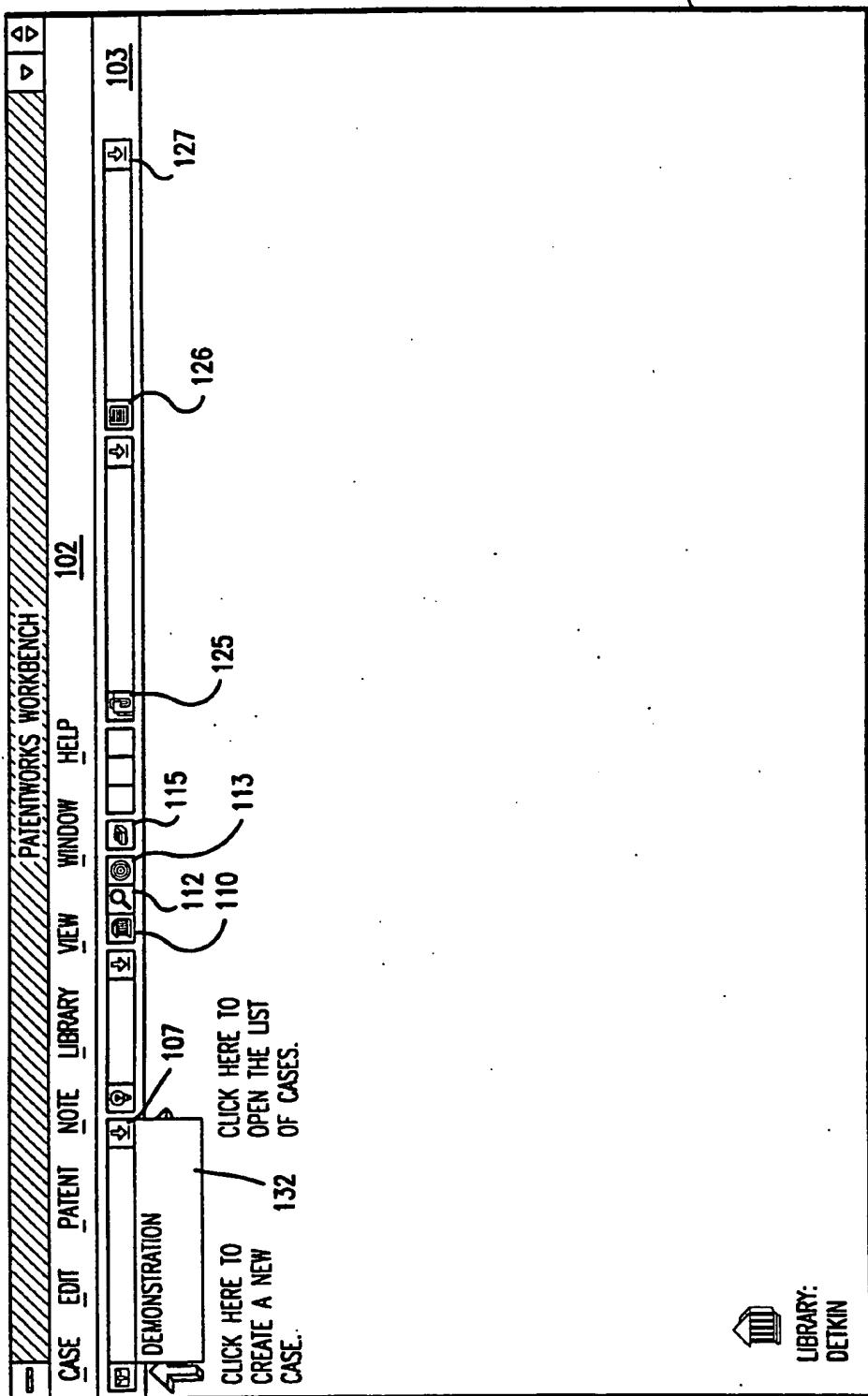


FIG. 12

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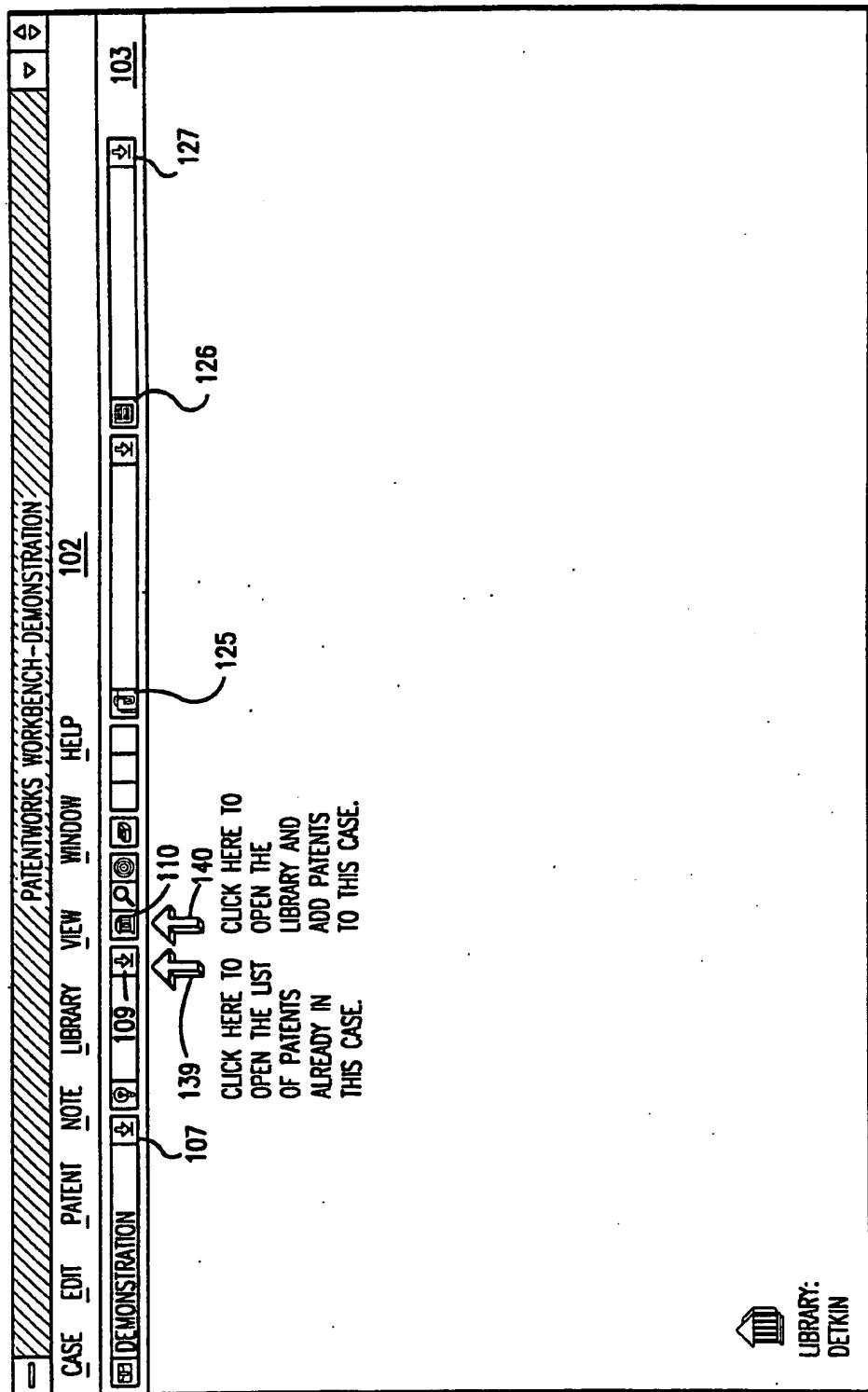


FIG. 13

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FIG. 14

| PATENTWORKS WORKBENCH-DEMONSTRATION  |             | 100           | ▼           | ▲              |             |               |             |     |
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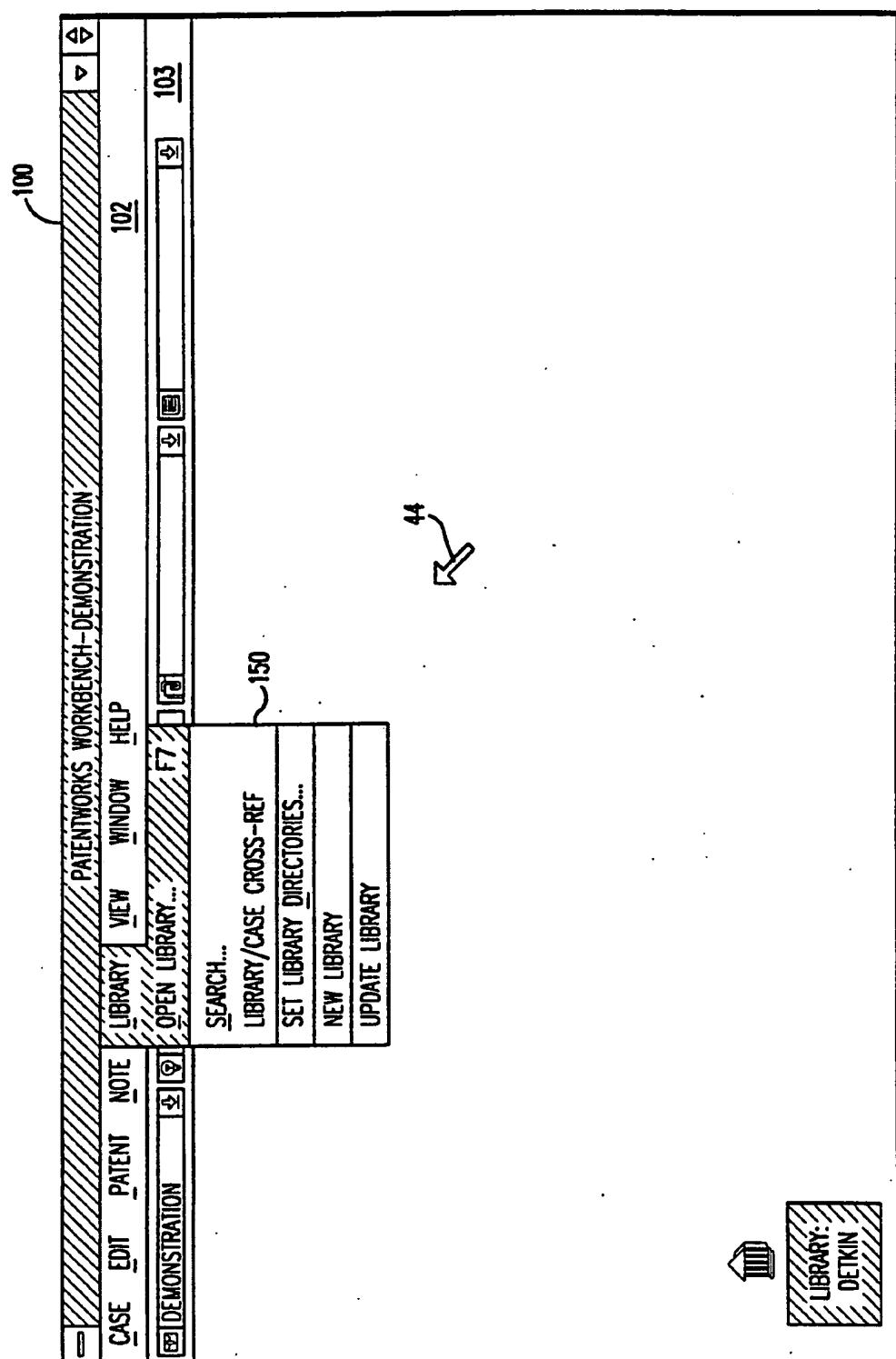
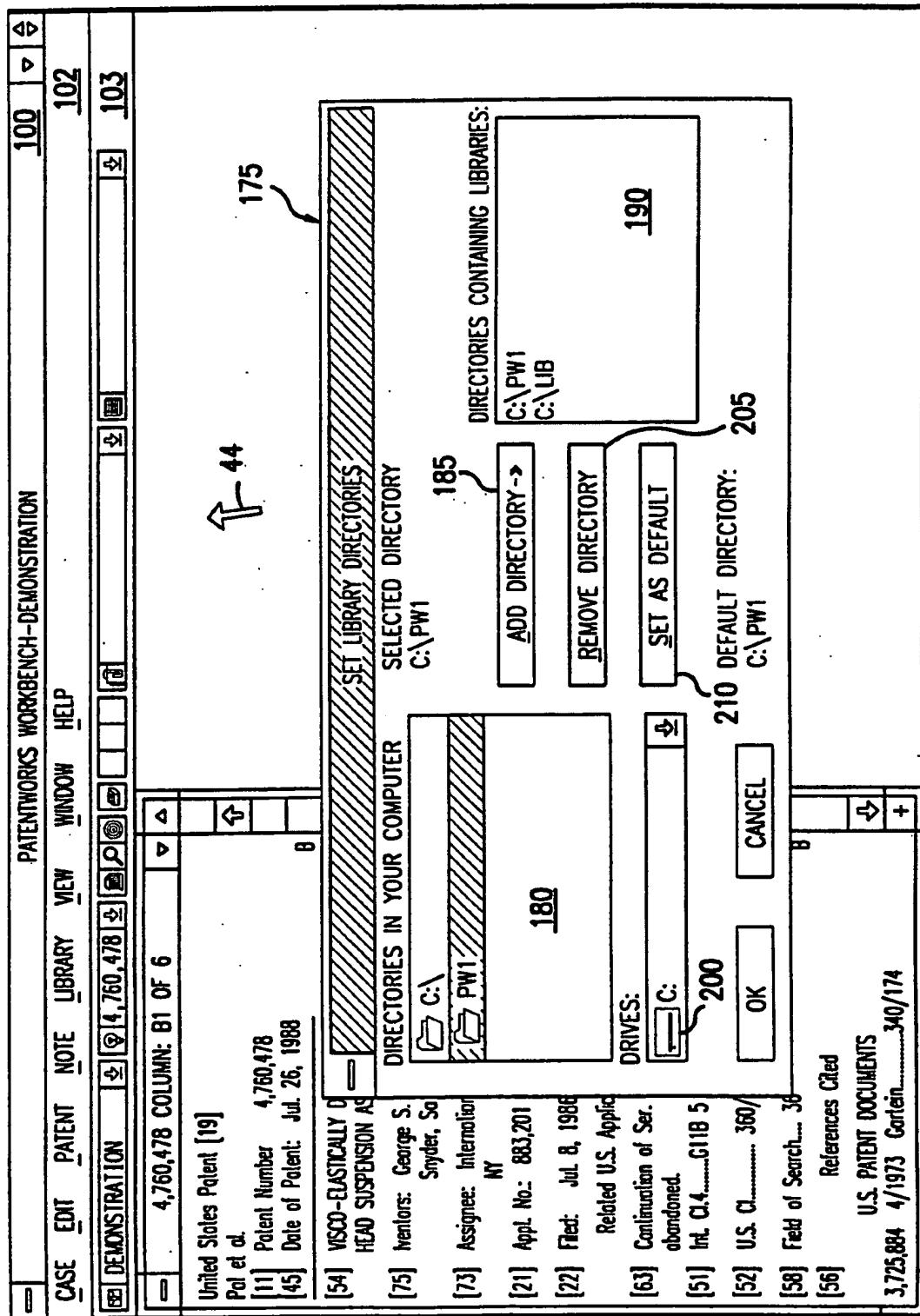


FIG. 15

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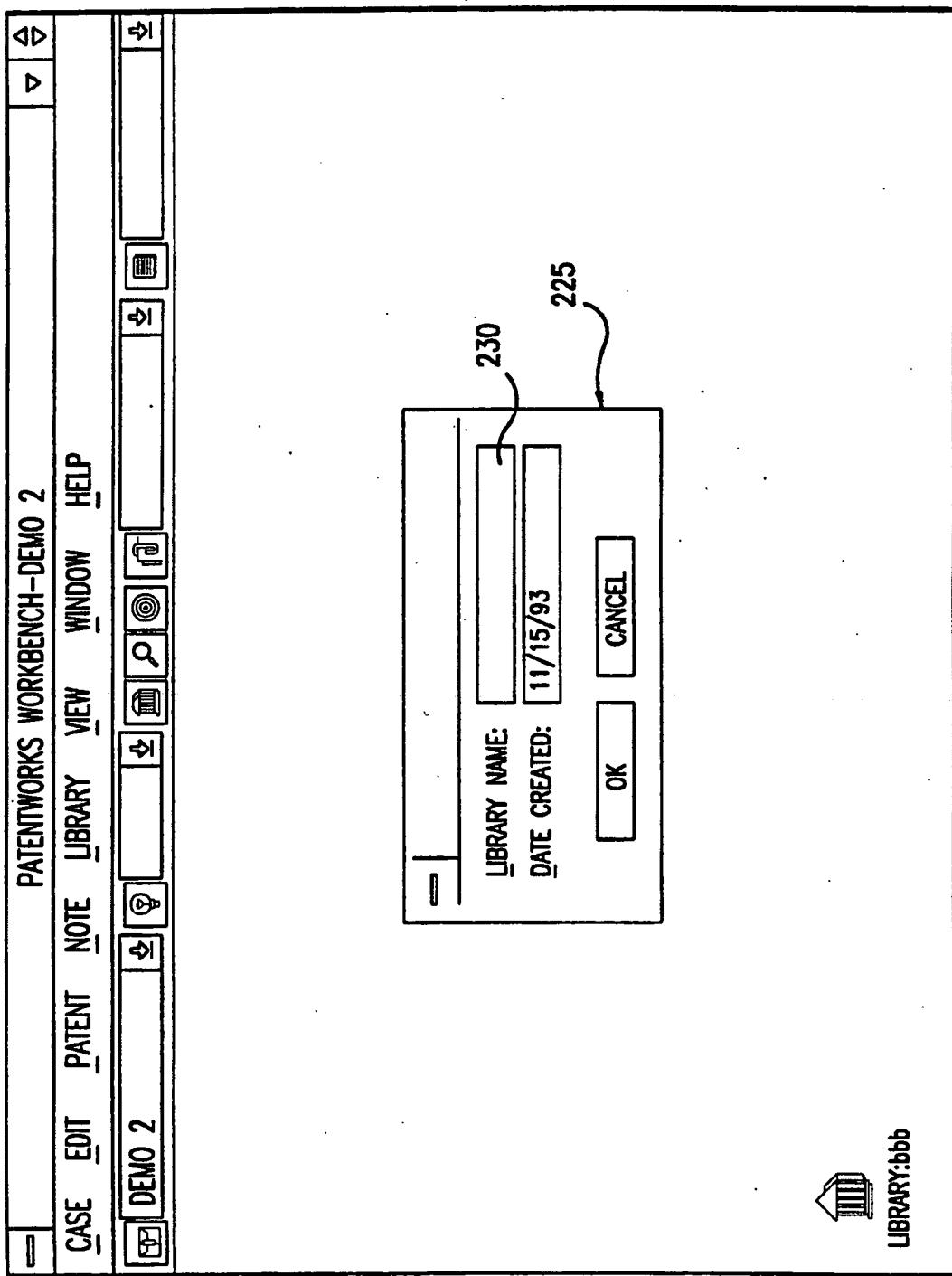


**SUBSTITUTE SHEET (RULE 26)**

FIG. 16

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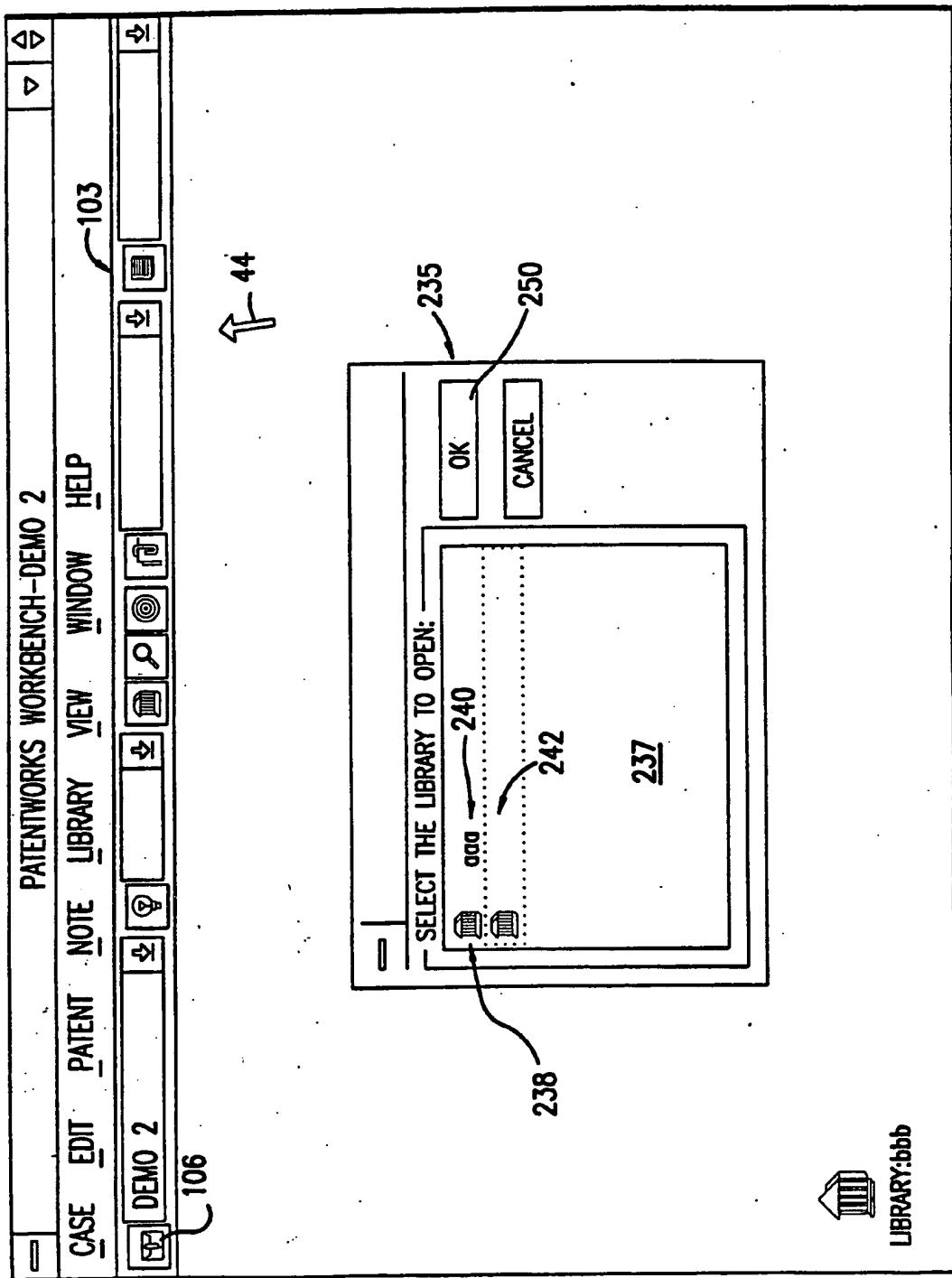
FIG. 17



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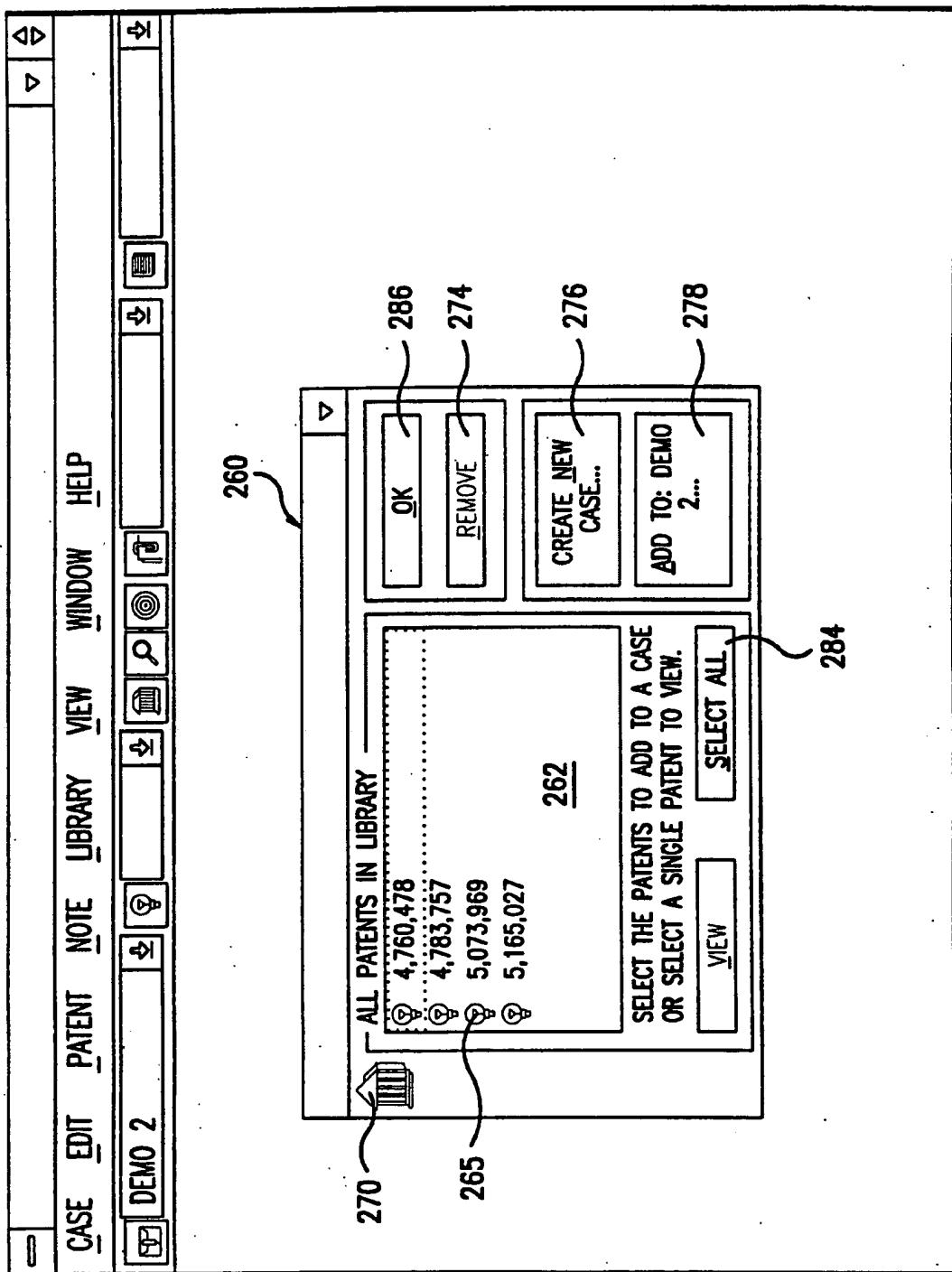
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FIG. 18



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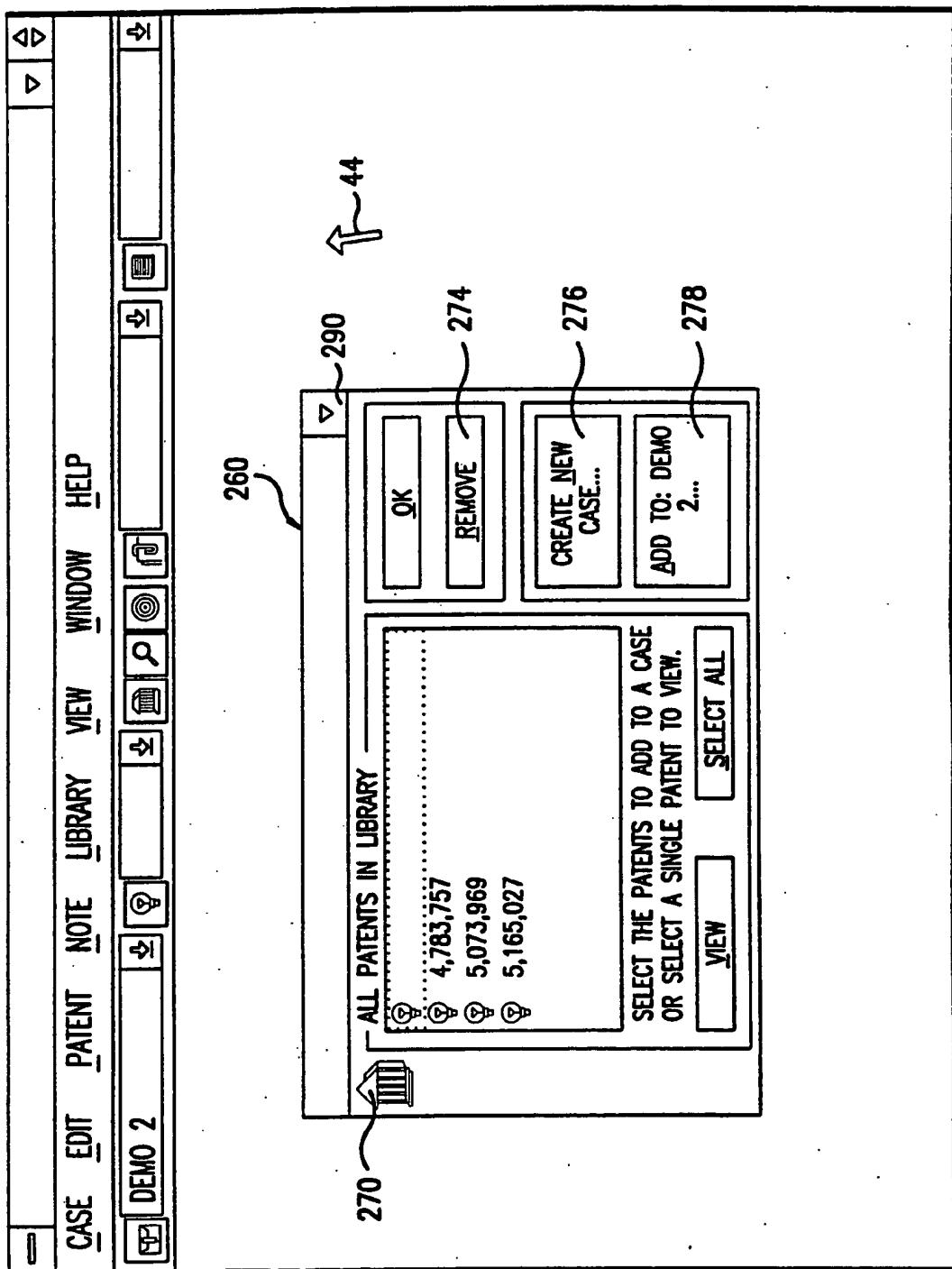


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FIG. 19

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FIG.20



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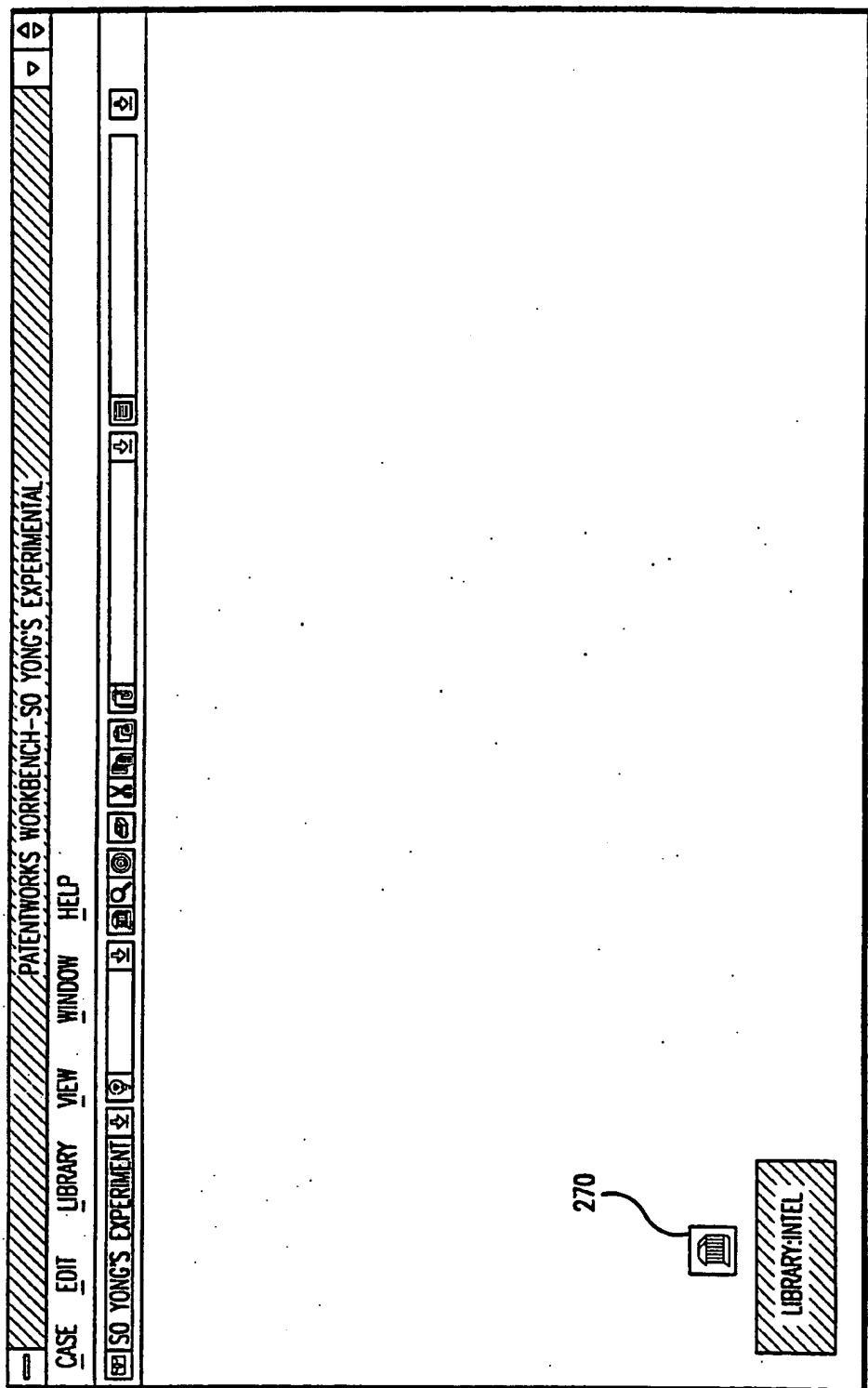
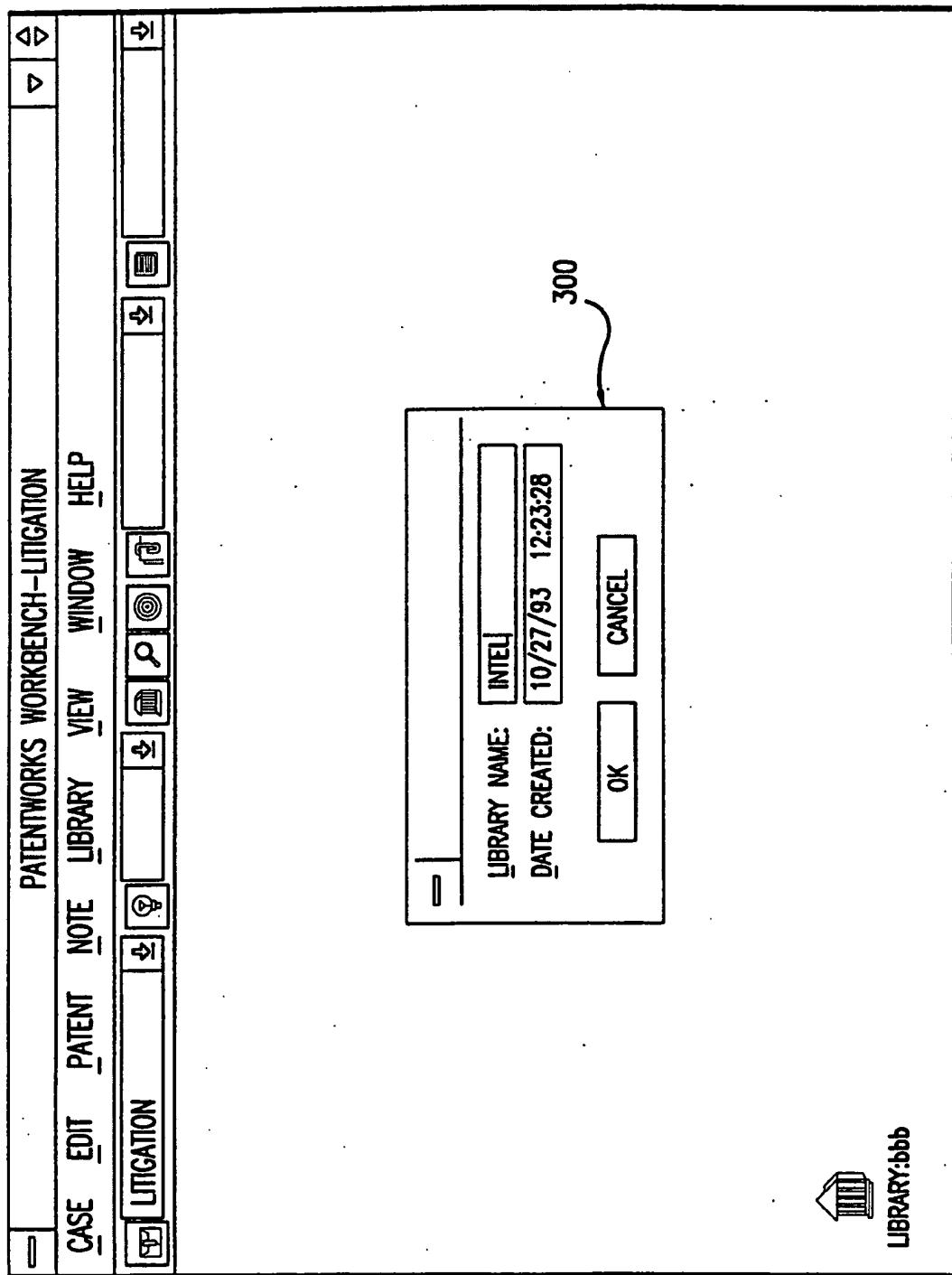


FIG. 21

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FIG. 22



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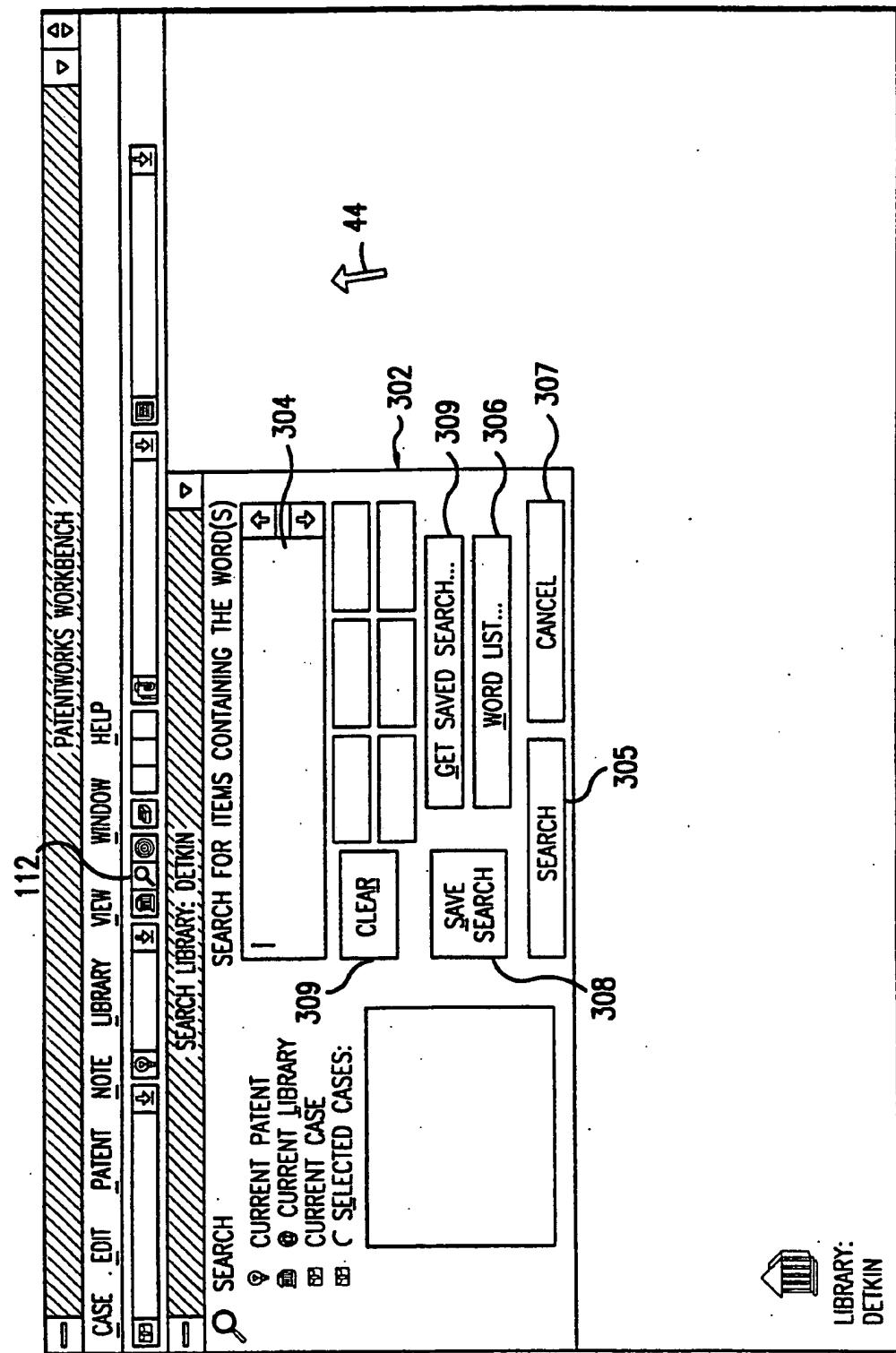
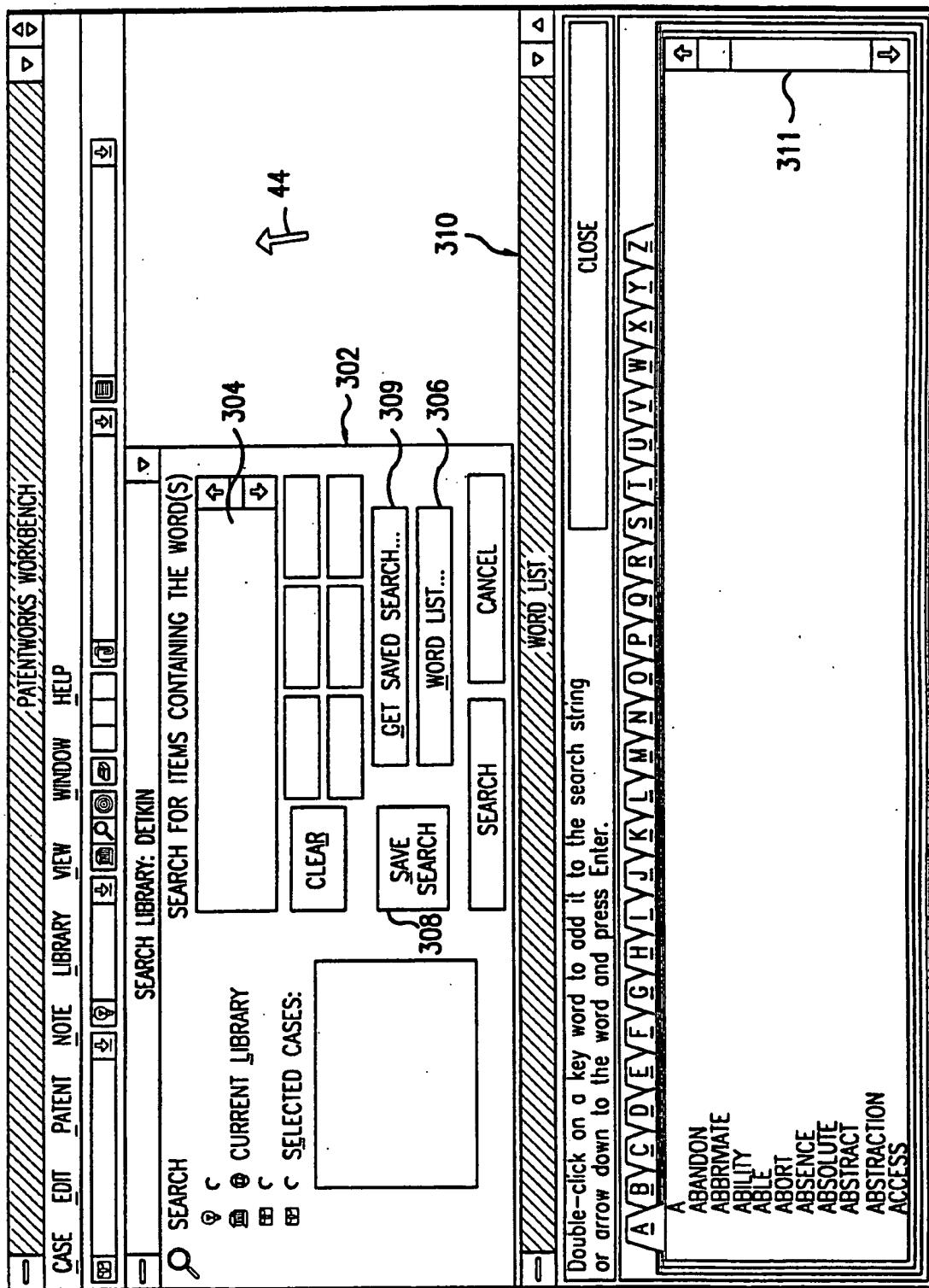


FIG. 23

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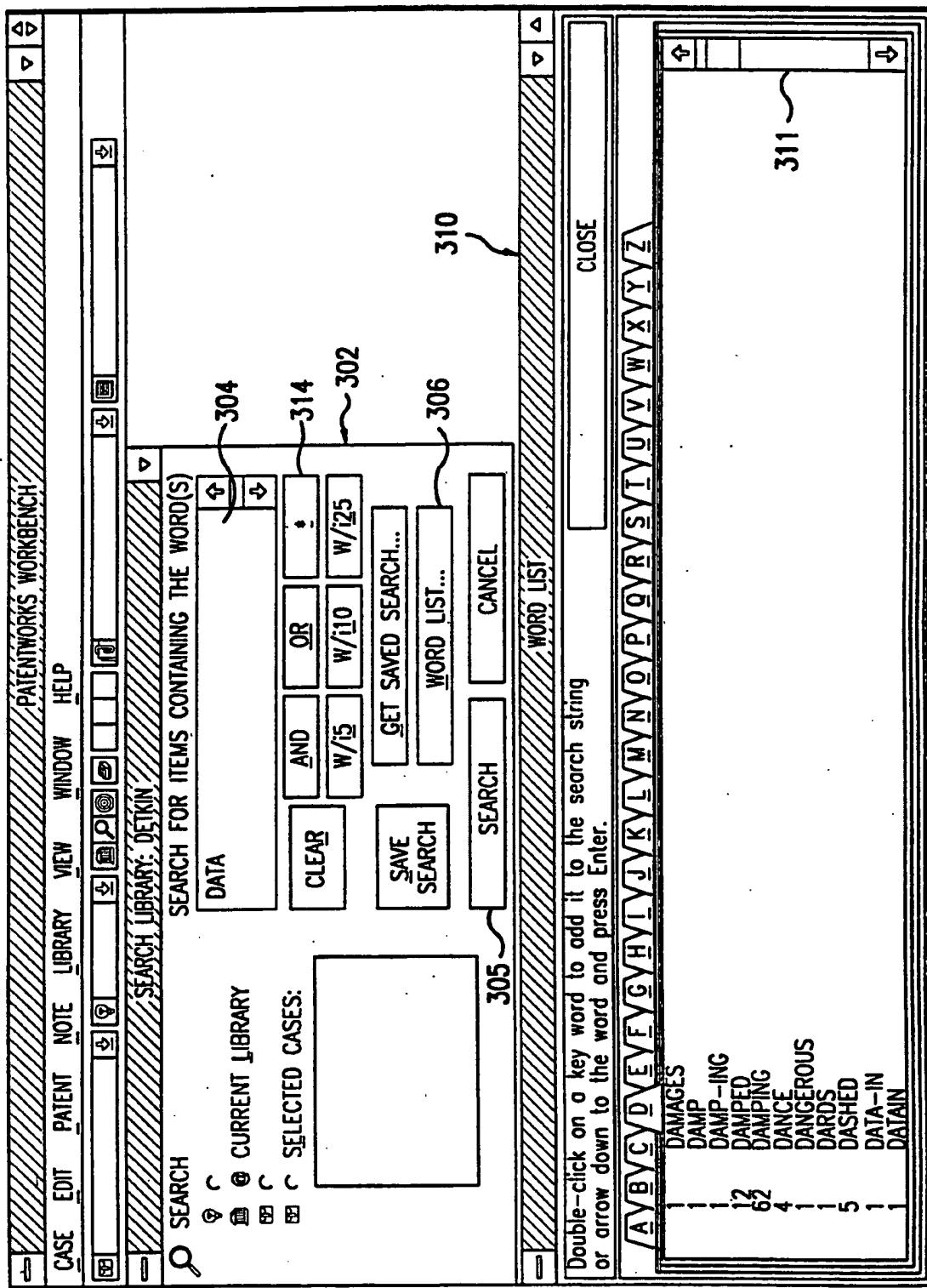
FIG.24



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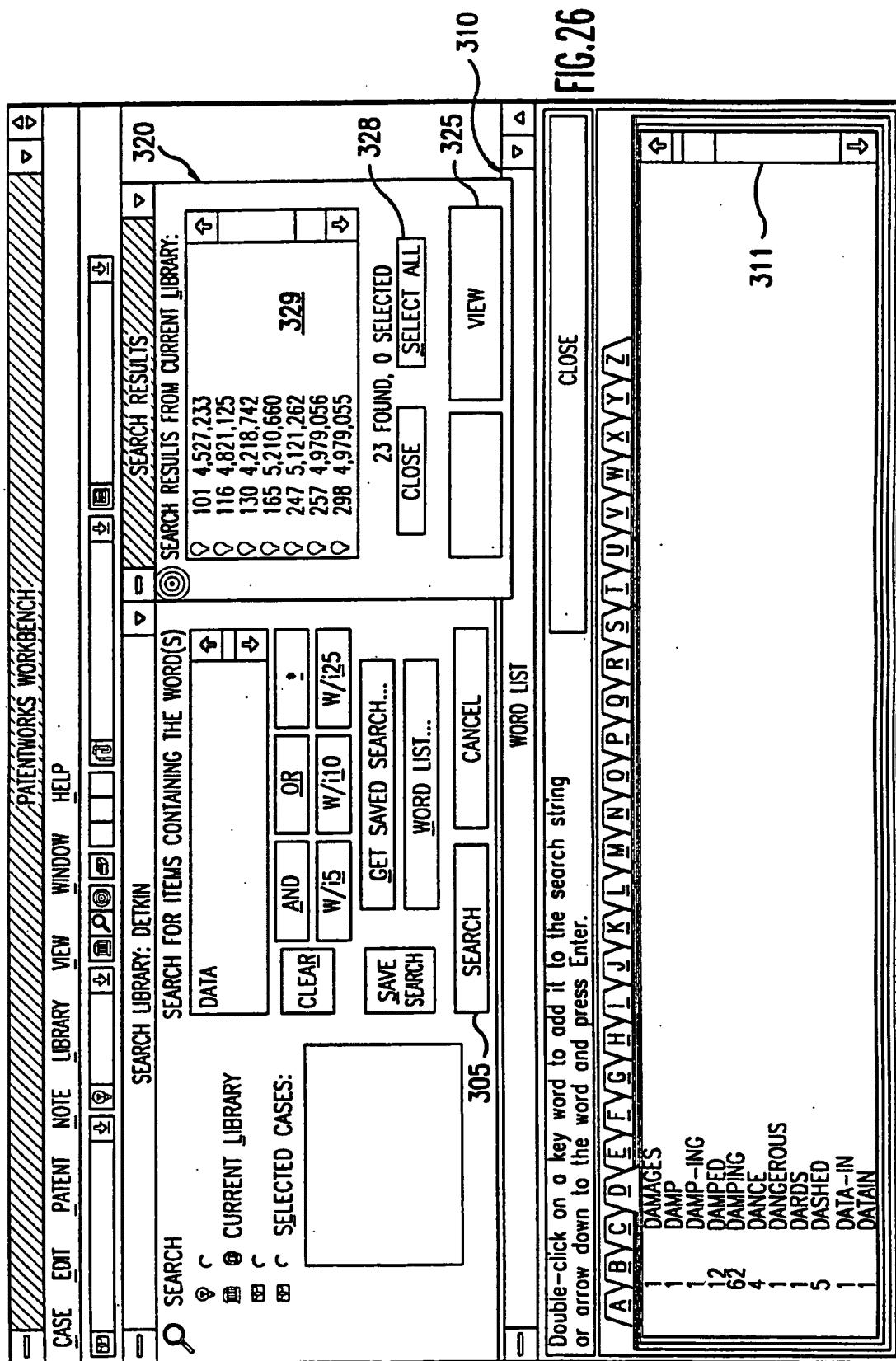
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FIG. 25

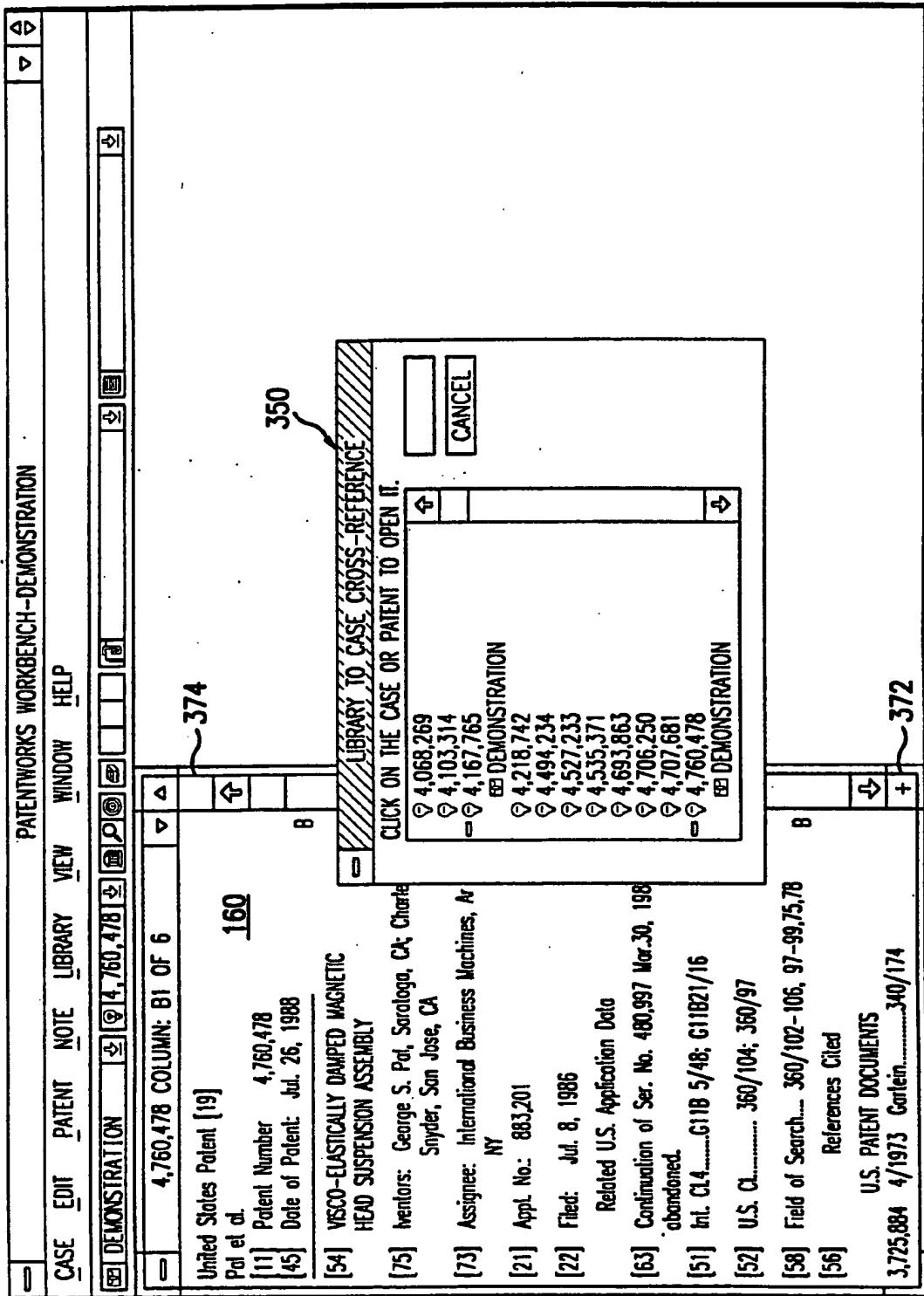


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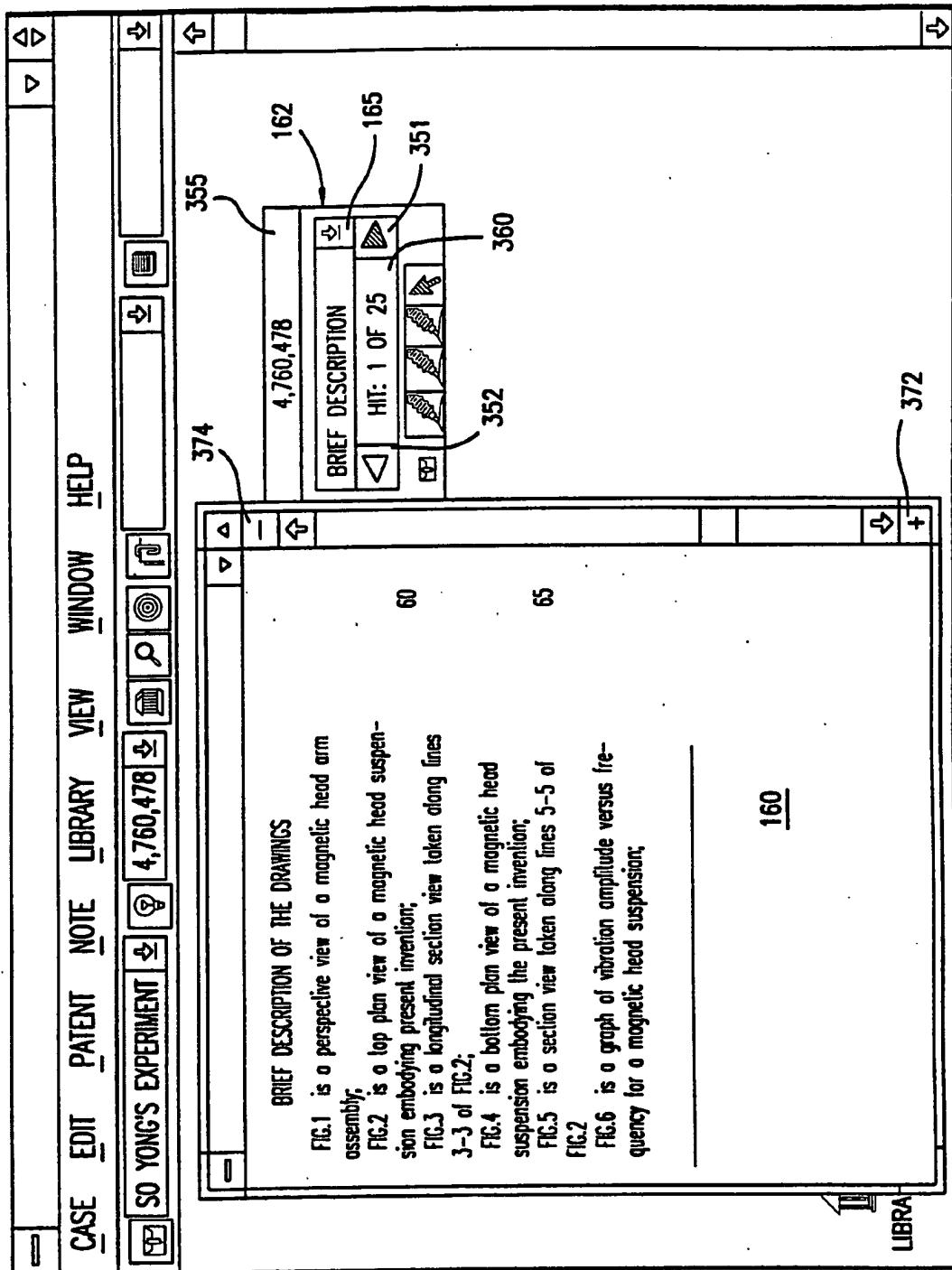
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FIG. 27

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SUBSTITUTE SHEET (RULE 26)

FIG.28

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FIG.29

| PATENTWORKS WORKBENCH-DÉMONSTRATION     |  |  |                  |         |      |              |      |     |  |
|---|--|--|------------------|---------|------|--------------|------|-----|--|
| CASE                                    | EDIT   | PATENT   | NOTE             | LIBRARY | VIEW | WINDOW       | HELP |     |  |
| DEMONSTRATION                           | ⊕  | 4,760,478  | COLUMNT: 61 OF 6 | 374     | ~    | 4,760,478    | ~    | 162 |  |
| United States Patent [19]               |  |  |                  |         |      |              |      |     |  |
| Pal et al.                              |  |  |                  |         |      |              |      |     |  |
| [11]                                    | Patent Number  | 4,760,478  |                  | B       |      | BIBLIOGRAPHY |      | 165 |  |
| [45]                                    | Date of Patent   | Jul. 26, 1988  |                  | B       |      | HIT: 0 OF 0  |      | 351 |  |
| [54]                                    | VISCO-ELASTICALLY DAMPED MAGNETIC HEAD SUSPENSION ASSEMBLY |  |                  |         |      |              |      |     |  |
| [75]                                    | Inventors:   | George S. Pal, Sorotzko, Cr; Charles G. Snyder, San Jose, CA |                  |         |      |              |      |     |  |
| [73]                                    | Assignee:  | International Business Machines, Armonk, NY                  |                  |         |      |              |      |     |  |
| [21]                                    | Appl. No.:   | 883,201  |                  |         |      |              |      |     |  |
| [22]                                    | Filed:   | Jul. 8, 1986   |                  |         |      |              |      |     |  |
| Related U.S. Application Data           |  |  |                  |         |      |              |      |     |  |
| [63]                                    | Continuation of Ser. No. 480,937 Mar. 30, 1983, abandoned. |  |                  |         |      |              |      |     |  |
| [51]                                    | Int. Cl 4  | G11B 5/48; G11B 21/16  |                  |         |      |              |      |     |  |
| [52]                                    | U.S. Cl.   | 360/104; 360/97  |                  |         |      |              |      |     |  |
| [58]                                    | Field of Search:   | 360/102-106, 97-99, 75, 78                                   |                  |         |      |              |      |     |  |
| [56]                                    | References Cited   |  |                  |         |      |              |      |     |  |
| U.S. PATENT DOCUMENTS                   |  |  |                  |         |      |              |      |     |  |
| 3,725,884 4/1973 Gartlein 340/174 + 372 |  |  |                  |         |      |              |      |     |  |

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FIG. 30

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| PATENTWORKS WORKBENCH-DEMONSTRATION |                          |                          |                          |                          |                          |                          |                          |                          |                          |
|-------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| CASE                                | EDIT                     | PATENT                   | NOTE                     | LIBRARY                  | VIEW                     | WINDOW                   | HELP                     | 455                      | 4,760,478                |
| DEMONSTRATION                       |                          |                          |                          |                          |                          |                          |                          |                          |                          |
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PATENTWORKS WORKBENCH-LITIGATION

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LITIGATION 5,165,027

United States Patent [19] [11] Patent Number 5,165,027  
[15] Date of Patent Nov. 17, 1992

[54] MICROPROCESSOR BREAKPOINT APPARATUS

[73] Assignee: Intel Corporation, Santa Clara, Calif. B

[75] Inventor: Joseph C. Krouskopf, Santa Clara, Calif.

[1] Notice: The portion of the term of this patent subsequent to Aug. 22, 2006 has been disclaimed.

[21] Appl. No.: 703,676

[22] Filed: May 20, 1991

Related U.S. Application Data B

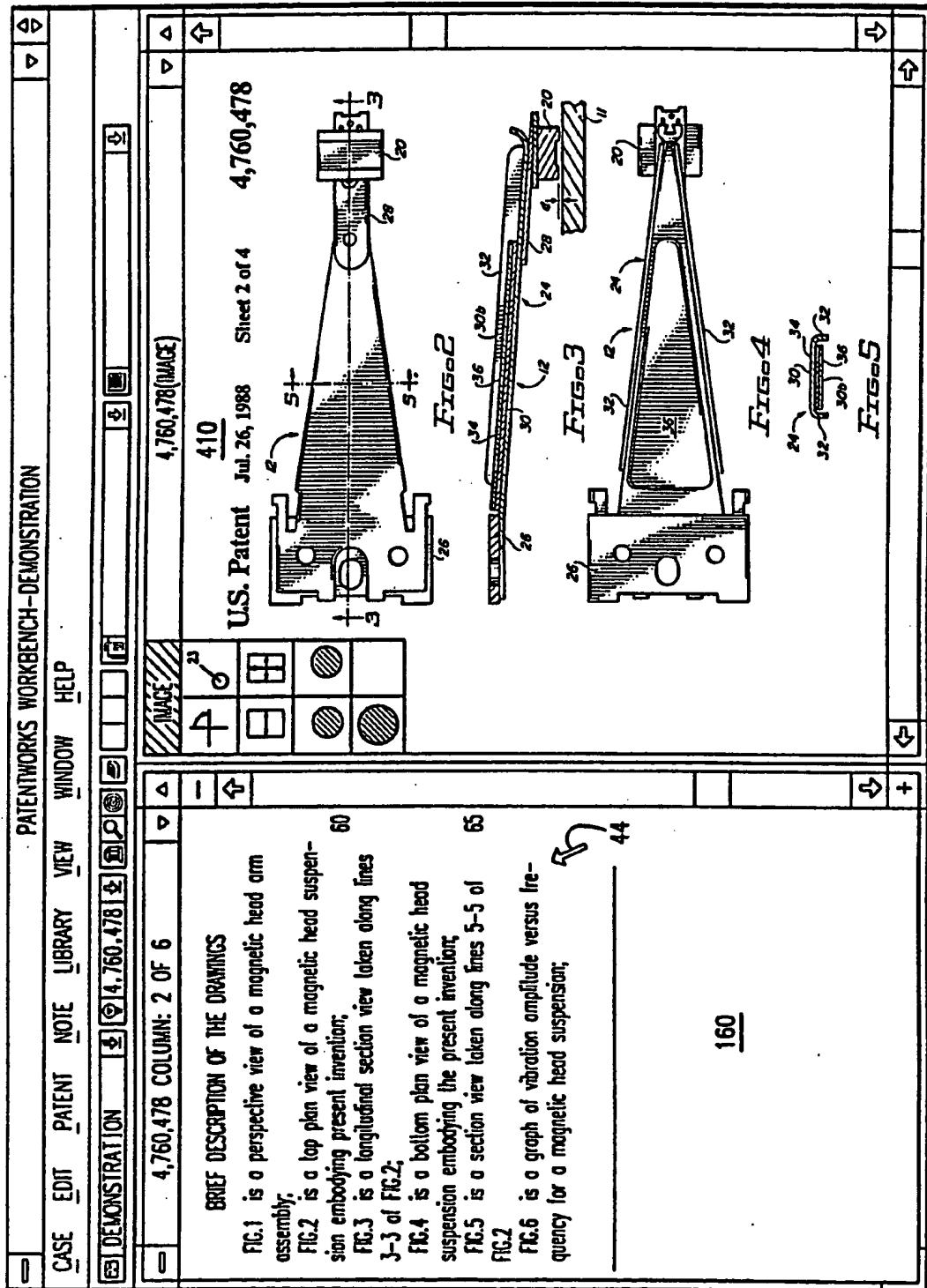
[63] Continuation of Ser. No. 593,399, Oct. 3, 1990, Pat. No. 5,053,944, which is a continuation of Ser. No. 370,024, Jan. 22, 1989, abandoned, which is a continuation of Ser. No. 274,636, Nov. 15, 1988, Pat. No. 4,860,195, which is a continuation of Ser. No. 822,263, Jan. 24, 1996, abandoned.

[51] Int. Cl. 006F 12/00

**SUBSTITUTE SHEET (RULE 26)**

FIG. 32

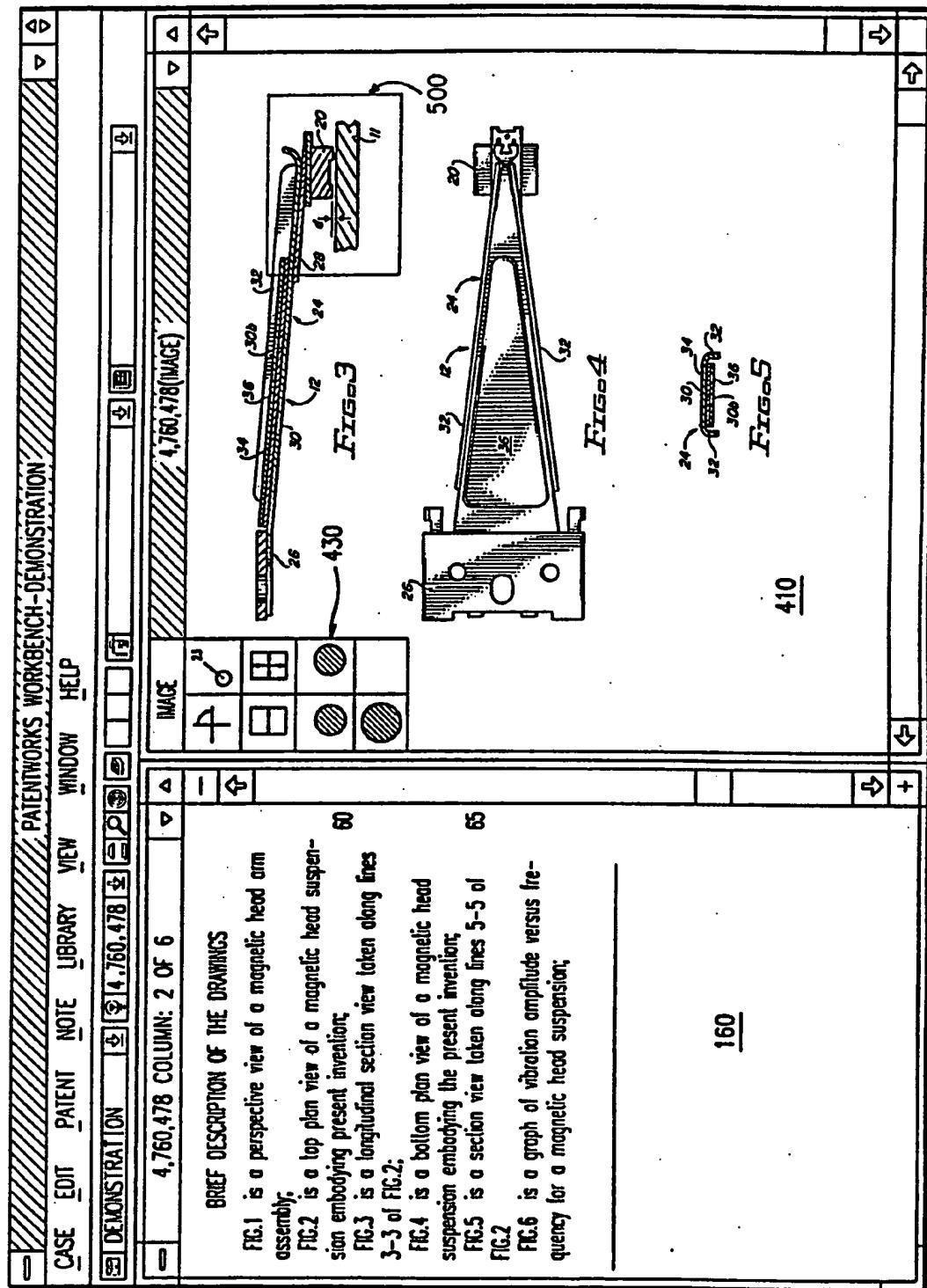
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**SUBSTITUTE SHEET (RULE 26)**

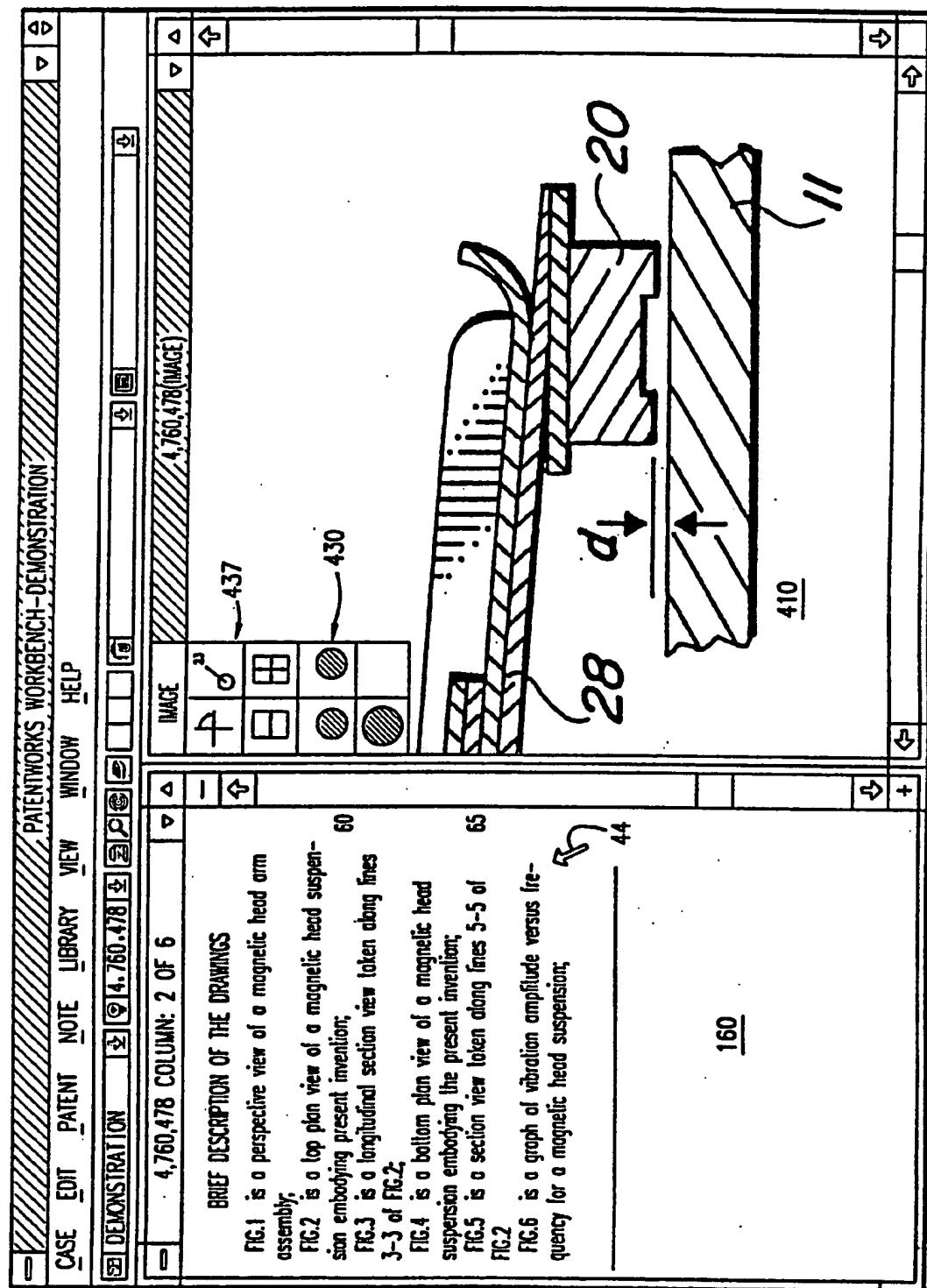
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FIG.34

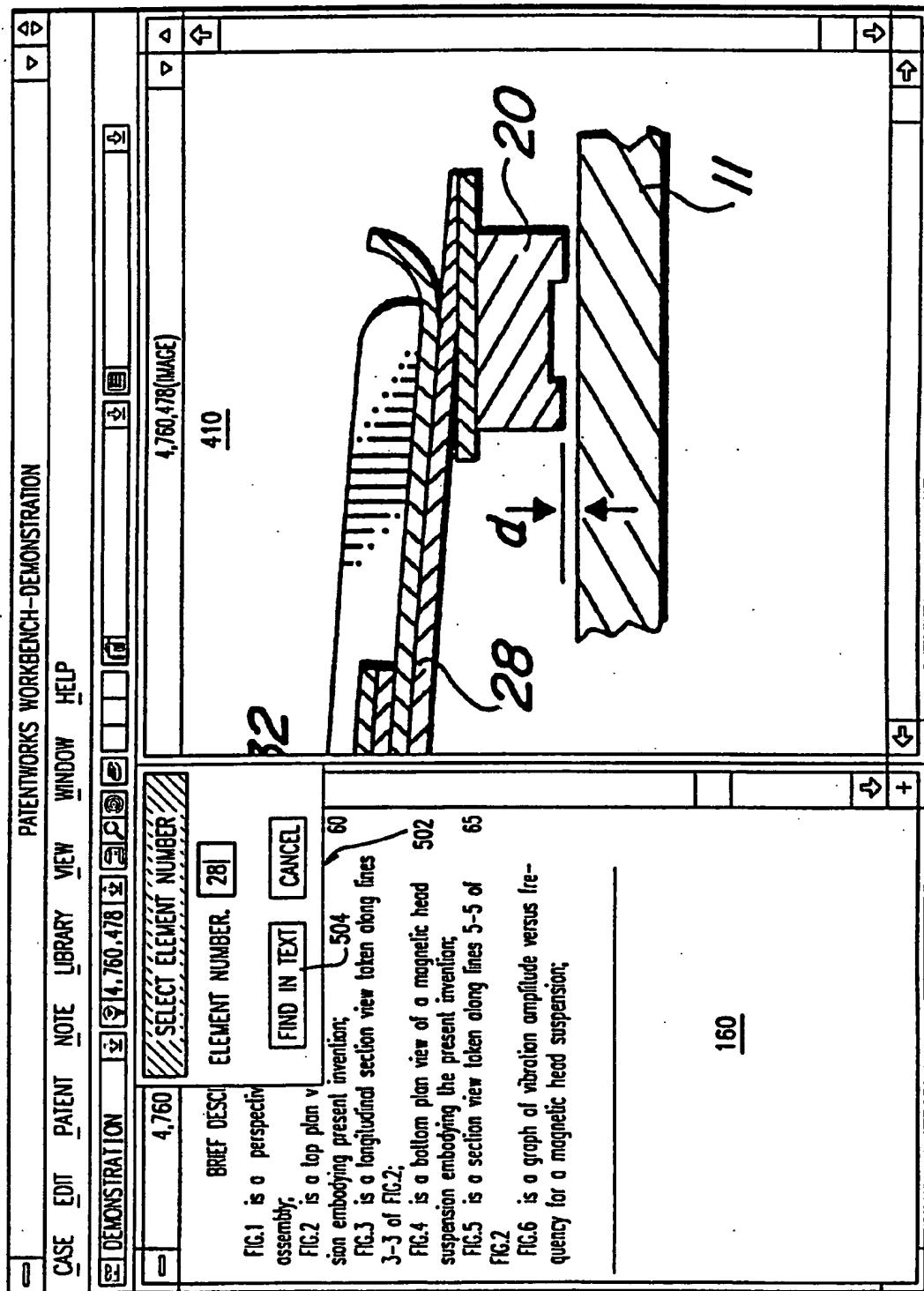


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FIG.35



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SUBSTITUTE SHEET (RULE 26)

FIG.36

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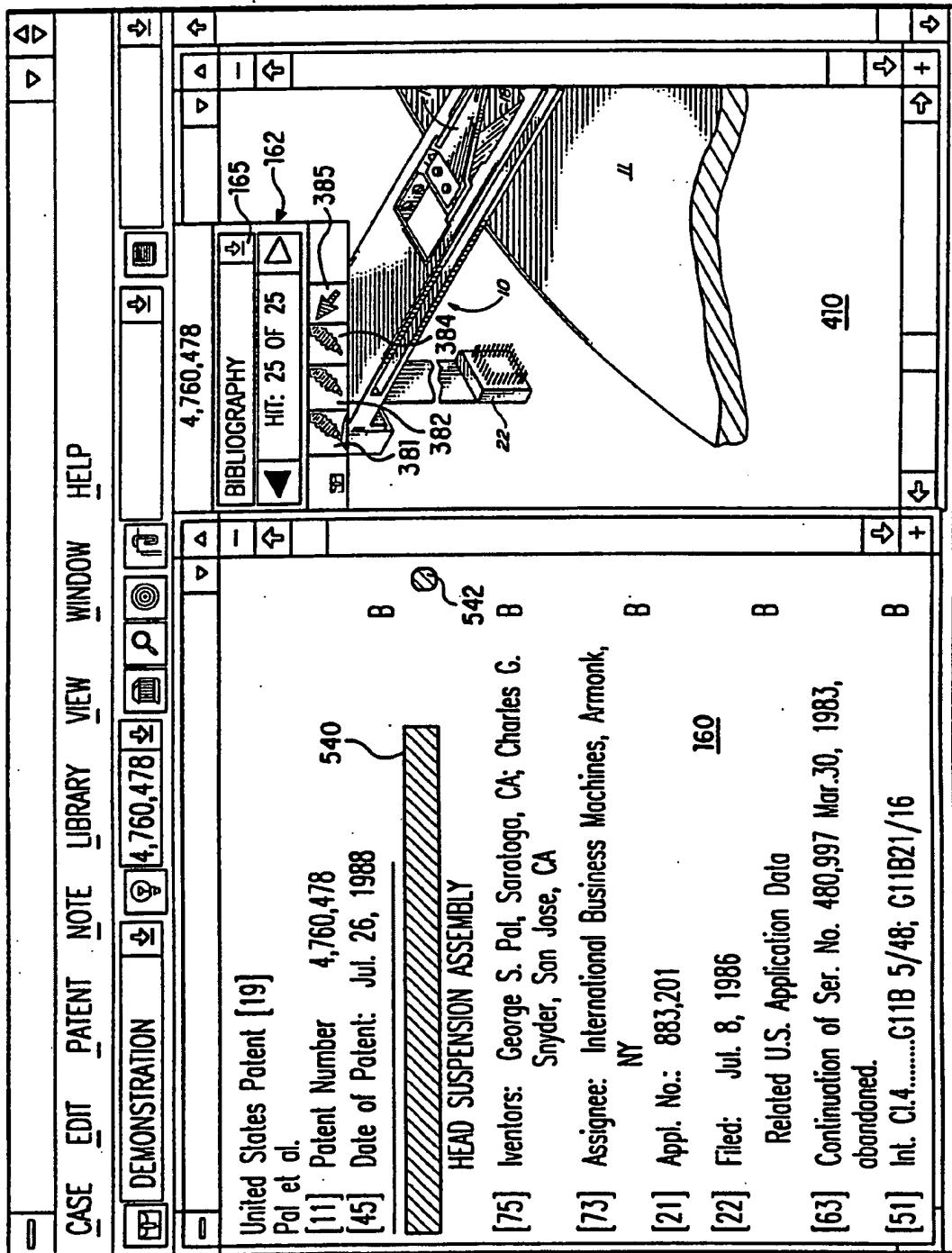


FIG. 37

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**PATENTWORKS WORKBENCH - LITIGATION**

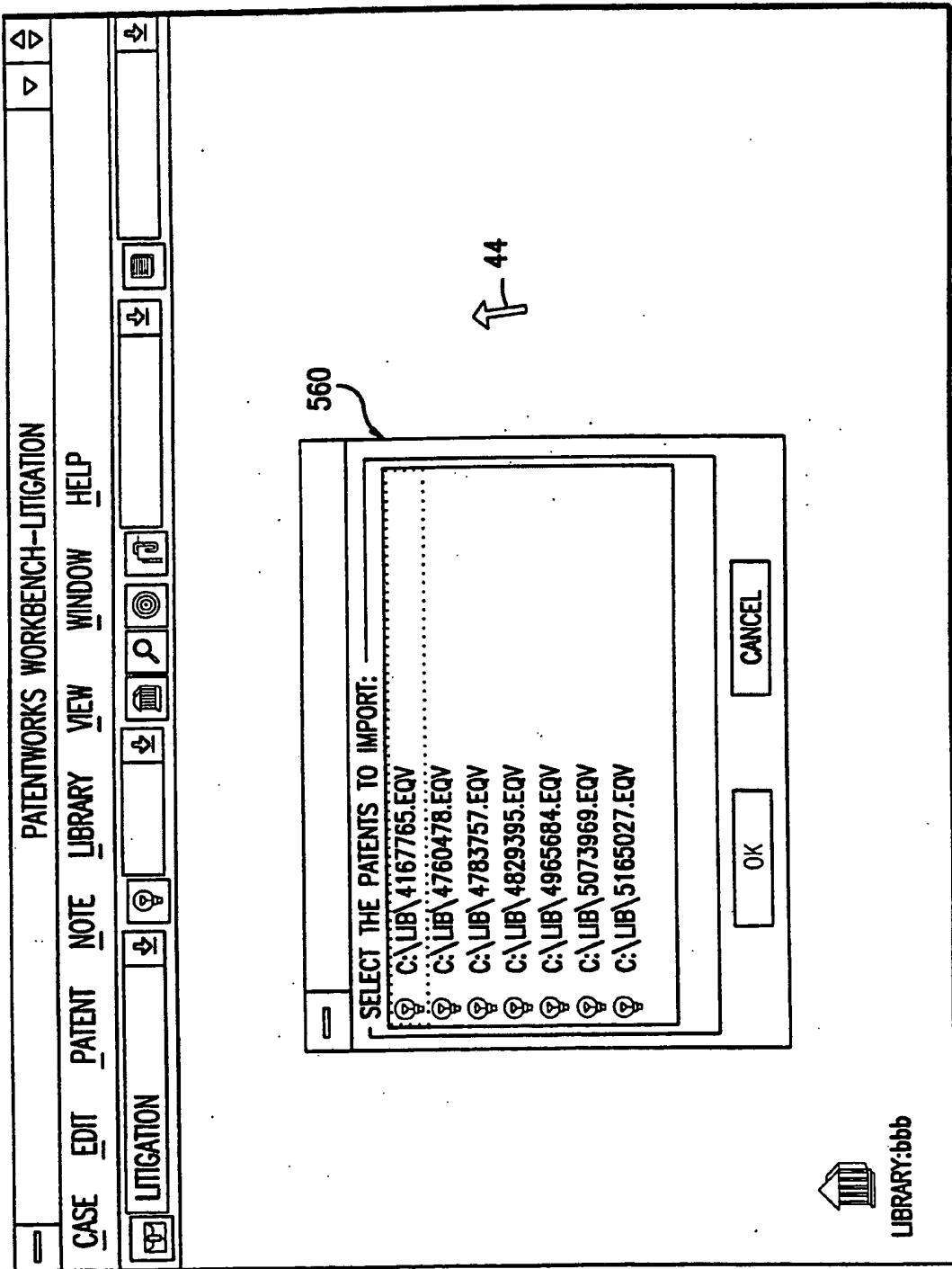
| CASE   | EDIT                     | LIBRARY                                       | VIEW                     | WINDOW  | HELP                     |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
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| <input checked="" type="checkbox"/> LITIGATION   | <input type="checkbox"/> | <input checked="" type="checkbox"/> 5,165,027 | <input type="checkbox"/> | <input type="checkbox"/>  | <input type="checkbox"/> |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| <table border="1"> <tr> <td colspan="2">5,165,027 COLUMN: B1</td> <td colspan="2">5,165,027 (IMAGE)</td> <td colspan="2">5,165,027</td> </tr> <tr> <td colspan="2">United States Patent [19][11] Patent Number 5,165,027</td> <td colspan="2">BIBLIOGRAPHY</td> <td colspan="2">5,165,027</td> </tr> <tr> <td colspan="2">[45] Date of Patent: Nov. 17, 1992</td> <td colspan="2">HIT: 1 OF 4</td> <td colspan="2">410</td> </tr> <tr> <td colspan="2">[54] MICROPROCESSOR BREAKPOINT APPARATUS</td> <td colspan="2">PID</td> <td colspan="2">PRECHARGE</td> </tr> <tr> <td colspan="2">[75] Inventor: Joseph C. Krauskopf, Santa Clara, Calif.</td> <td colspan="2">235</td> <td colspan="2">46</td> </tr> <tr> <td colspan="2">[73] Assignee: Intel Corporation, Santa Clara, Calif.</td> <td colspan="2">235</td> <td colspan="2">HIT</td> </tr> <tr> <td colspan="2">[+] Notice: The portion of the term of this patent subsequent to Aug. 22, 2006 has been disclaimed.</td> <td colspan="2">160</td> <td colspan="2">46</td> </tr> <tr> <td colspan="2">[21] Appl. No.: 703,676</td> <td colspan="2">B</td> <td colspan="2">5,165,027 COLUMN: B1</td> </tr> <tr> <td colspan="2">[22] Fiel: May 20, 1991</td> <td colspan="2">B</td> <td colspan="2">United States Patent [19][11] Patent Number 5,165,027</td> </tr> <tr> <td colspan="2">Related U.S. Application Data</td> <td colspan="2">B</td> <td colspan="2">[45] Date of Patent: Nov. 17, 1992</td> </tr> <tr> <td colspan="2">[63] Continuation of Ser. No. 593,399, Oct. 3, 1990, Pat. No. 5,053,944, which is a continuation of Ser. No. 370,024, Jun. 22, 1989, abandoned, which is a continuation of Ser. No. 274,636, Nov. 15, 1988, Pat. No. 4,850,195, which is a continuation of Ser. No. 822,263, Jun. 24, 1986, abandoned.</td> <td colspan="2">B</td> <td colspan="2">[54] MICROPROCESSOR BREAKPOINT APPARATUS</td> </tr> <tr> <td colspan="2">[51] Int. Cl. 000F 12/00</td> <td colspan="2">B</td> <td colspan="2">[75] Inventor: Joseph C. Krauskopf, Santa Clara, Calif.</td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">555</td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">[73] Assignee: Intel Corporation, Santa Clara, Calif.</td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">B</td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">[+] Notice: The portion of the term of this patent subsequent to Aug. 22, 2006 has been</td> </tr> </table> |                          |   |                          |   |                          | 5,165,027 COLUMN: B1 |  | 5,165,027 (IMAGE) |  | 5,165,027 |  | United States Patent [19][11] Patent Number 5,165,027 |  | BIBLIOGRAPHY |  | 5,165,027 |  | [45] Date of Patent: Nov. 17, 1992 |  | HIT: 1 OF 4 |  | 410 |  | [54] MICROPROCESSOR BREAKPOINT APPARATUS |  | PID |  | PRECHARGE |  | [75] Inventor: Joseph C. Krauskopf, Santa Clara, Calif. |  | 235 |  | 46 |  | [73] Assignee: Intel Corporation, Santa Clara, Calif. |  | 235 |  | HIT |  | [+] Notice: The portion of the term of this patent subsequent to Aug. 22, 2006 has been disclaimed. |  | 160 |  | 46 |  | [21] Appl. No.: 703,676 |  | B |  | 5,165,027 COLUMN: B1 |  | [22] Fiel: May 20, 1991 |  | B |  | United States Patent [19][11] Patent Number 5,165,027 |  | Related U.S. Application Data |  | B |  | [45] Date of Patent: Nov. 17, 1992 |  | [63] Continuation of Ser. No. 593,399, Oct. 3, 1990, Pat. No. 5,053,944, which is a continuation of Ser. No. 370,024, Jun. 22, 1989, abandoned, which is a continuation of Ser. No. 274,636, Nov. 15, 1988, Pat. No. 4,850,195, which is a continuation of Ser. No. 822,263, Jun. 24, 1986, abandoned. |  | B |  | [54] MICROPROCESSOR BREAKPOINT APPARATUS |  | [51] Int. Cl. 000F 12/00 |  | B |  | [75] Inventor: Joseph C. Krauskopf, Santa Clara, Calif. |  |  |  |  |  | 555 |  |  |  |  |  | [73] Assignee: Intel Corporation, Santa Clara, Calif. |  |  |  |  |  | B |  |  |  |  |  | [+] Notice: The portion of the term of this patent subsequent to Aug. 22, 2006 has been |  |
| 5,165,027 COLUMN: B1   |                          | 5,165,027 (IMAGE)                             |                          | 5,165,027   |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| United States Patent [19][11] Patent Number 5,165,027  |                          | BIBLIOGRAPHY                                  |                          | 5,165,027   |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| [45] Date of Patent: Nov. 17, 1992   |                          | HIT: 1 OF 4                                   |                          | 410   |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| [54] MICROPROCESSOR BREAKPOINT APPARATUS   |                          | PID   |                          | PRECHARGE   |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| [75] Inventor: Joseph C. Krauskopf, Santa Clara, Calif.  |                          | 235   |                          | 46  |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| [73] Assignee: Intel Corporation, Santa Clara, Calif.  |                          | 235   |                          | HIT   |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| [+] Notice: The portion of the term of this patent subsequent to Aug. 22, 2006 has been disclaimed.  |                          | 160   |                          | 46  |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| [21] Appl. No.: 703,676  |                          | B   |                          | 5,165,027 COLUMN: B1  |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| [22] Fiel: May 20, 1991  |                          | B   |                          | United States Patent [19][11] Patent Number 5,165,027                                   |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| Related U.S. Application Data  |                          | B   |                          | [45] Date of Patent: Nov. 17, 1992  |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| [63] Continuation of Ser. No. 593,399, Oct. 3, 1990, Pat. No. 5,053,944, which is a continuation of Ser. No. 370,024, Jun. 22, 1989, abandoned, which is a continuation of Ser. No. 274,636, Nov. 15, 1988, Pat. No. 4,850,195, which is a continuation of Ser. No. 822,263, Jun. 24, 1986, abandoned.   |                          | B   |                          | [54] MICROPROCESSOR BREAKPOINT APPARATUS  |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
| [51] Int. Cl. 000F 12/00   |                          | B   |                          | [75] Inventor: Joseph C. Krauskopf, Santa Clara, Calif.                                 |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
|  |                          |   |                          | 555   |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
|  |                          |   |                          | [73] Assignee: Intel Corporation, Santa Clara, Calif.                                   |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
|  |                          |   |                          | B   |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |
|  |                          |   |                          | [+] Notice: The portion of the term of this patent subsequent to Aug. 22, 2006 has been |                          |                      |  |                   |  |           |  |   |  |              |  |           |  |                                    |  |             |  |     |  |  |  |     |  |           |  |   |  |     |  |    |  |   |  |     |  |     |  |   |  |     |  |    |  |                         |  |   |  |                      |  |                         |  |   |  |   |  |                               |  |   |  |                                    |  |  |  |   |  |  |  |                          |  |   |  |   |  |  |  |  |  |     |  |  |  |  |  |   |  |  |  |  |  |   |  |  |  |  |  |   |  |

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FIG. 38

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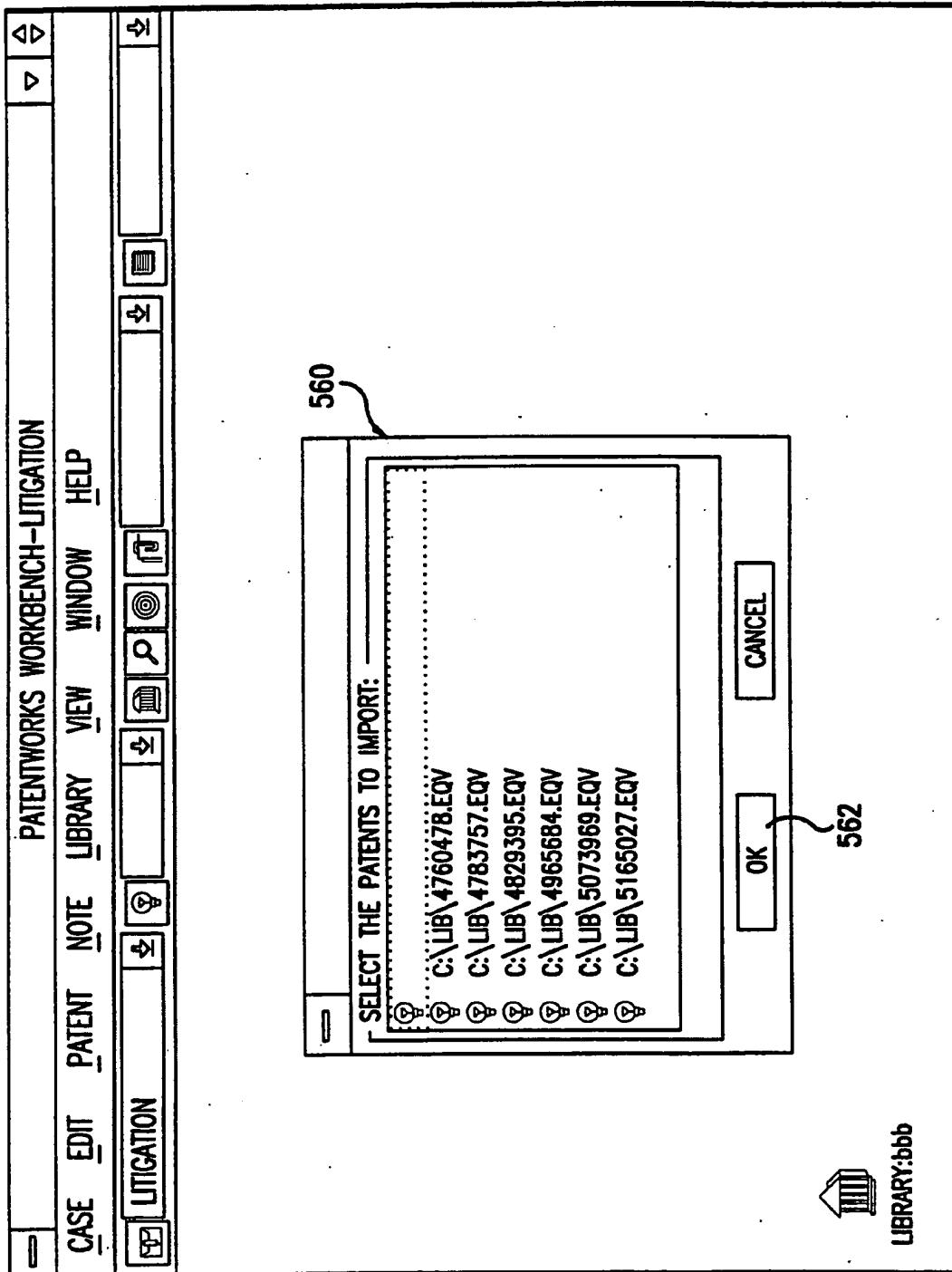
FIG. 39



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FIG.40



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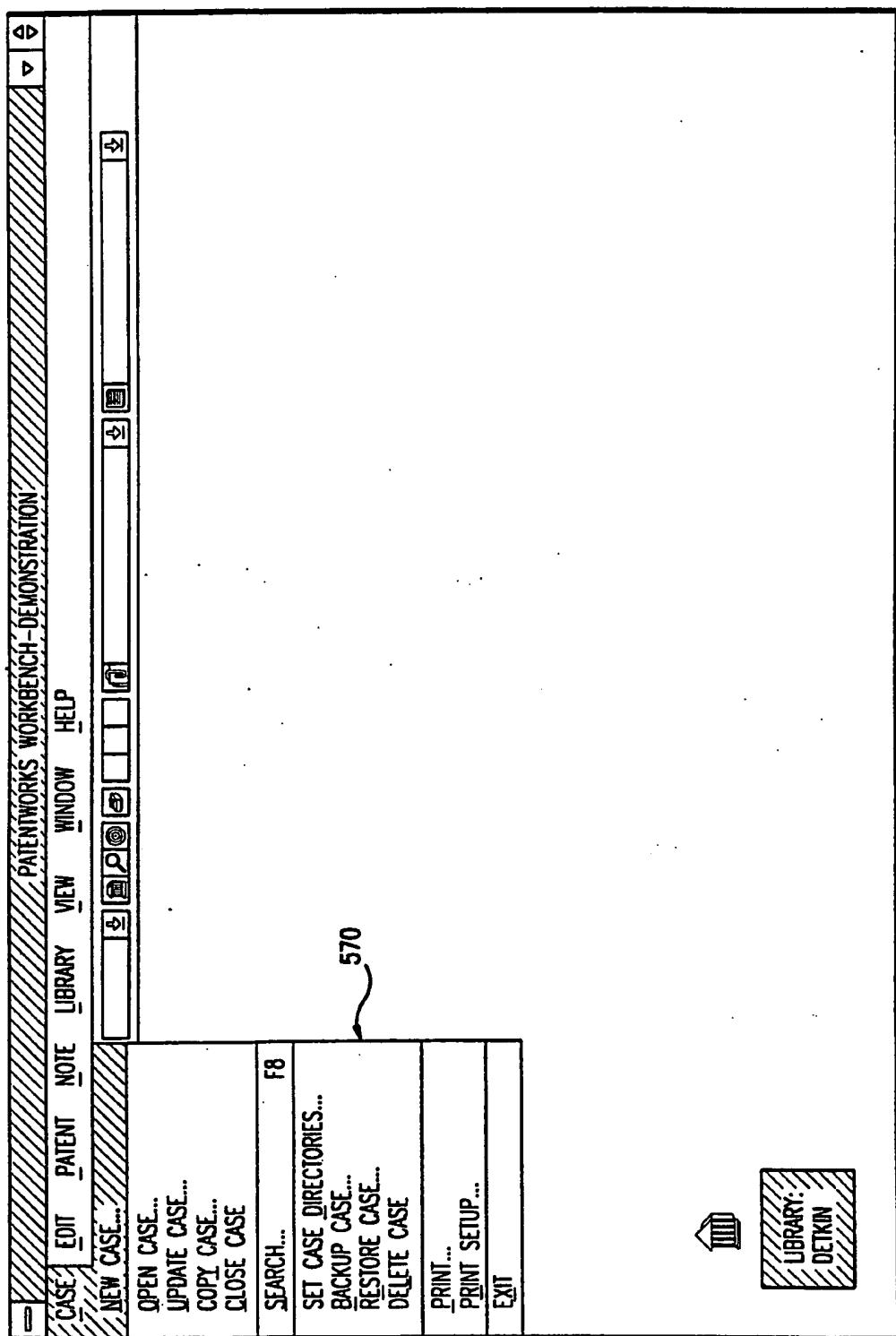


FIG. 41

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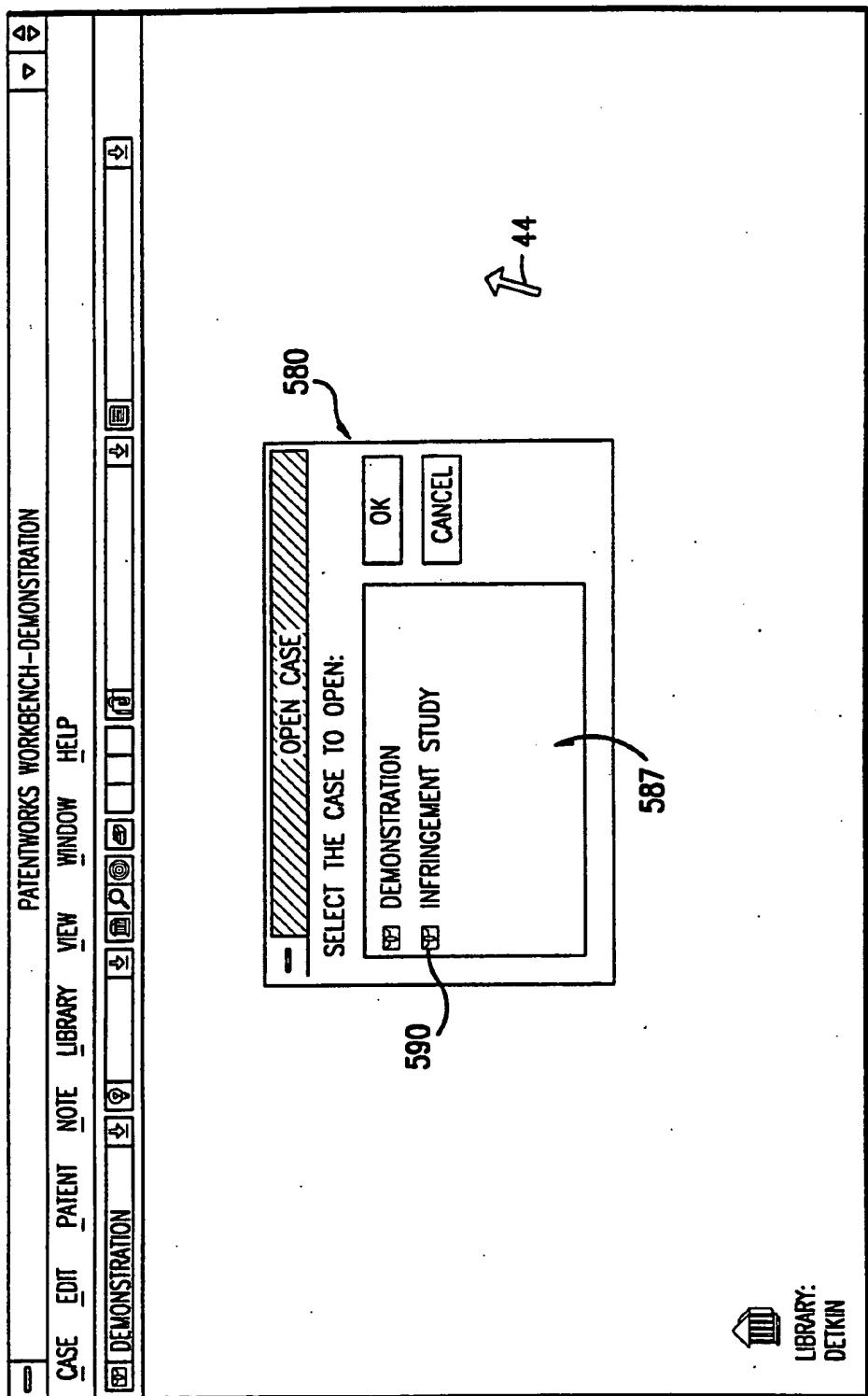
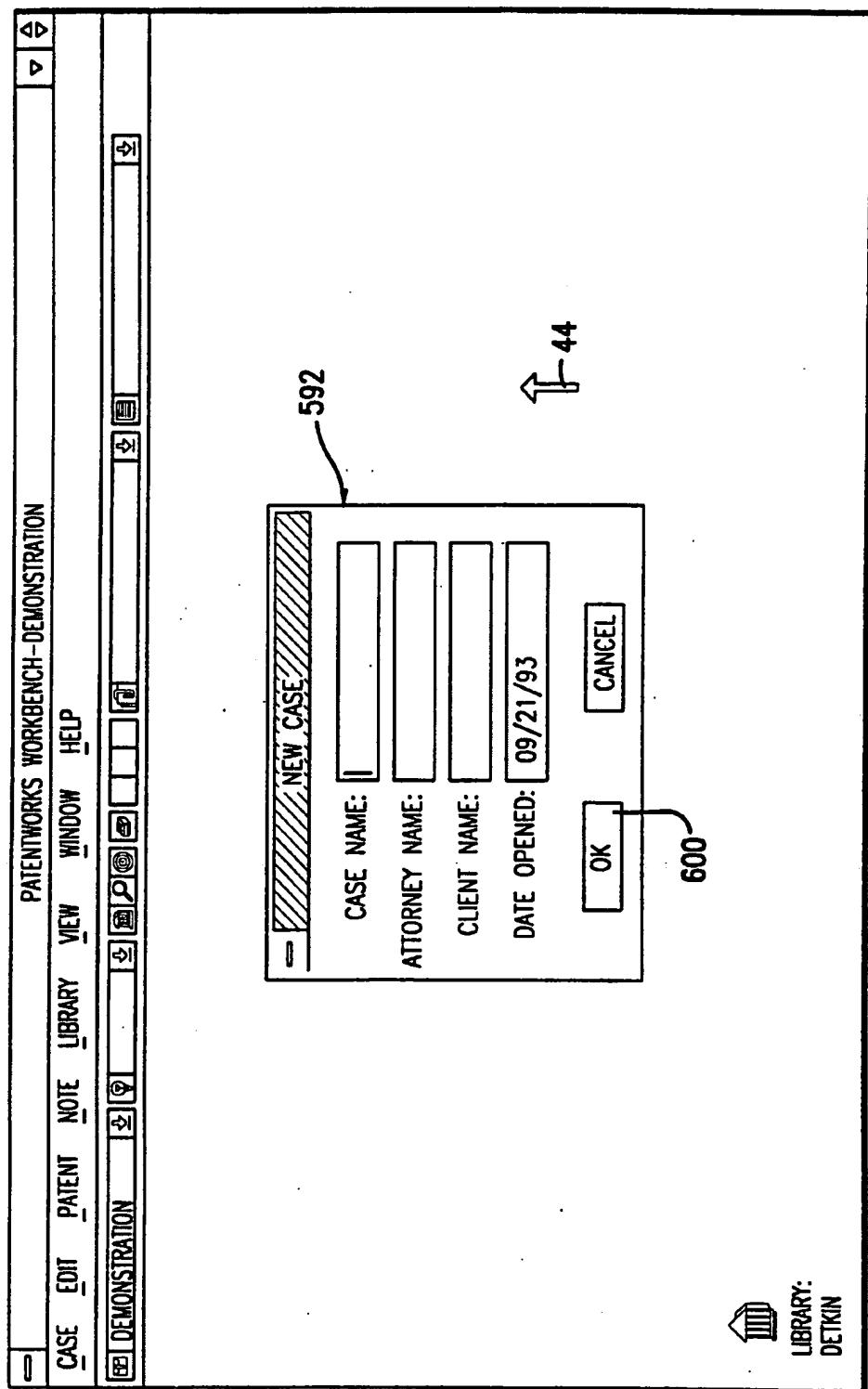


FIG.42

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FIG.43

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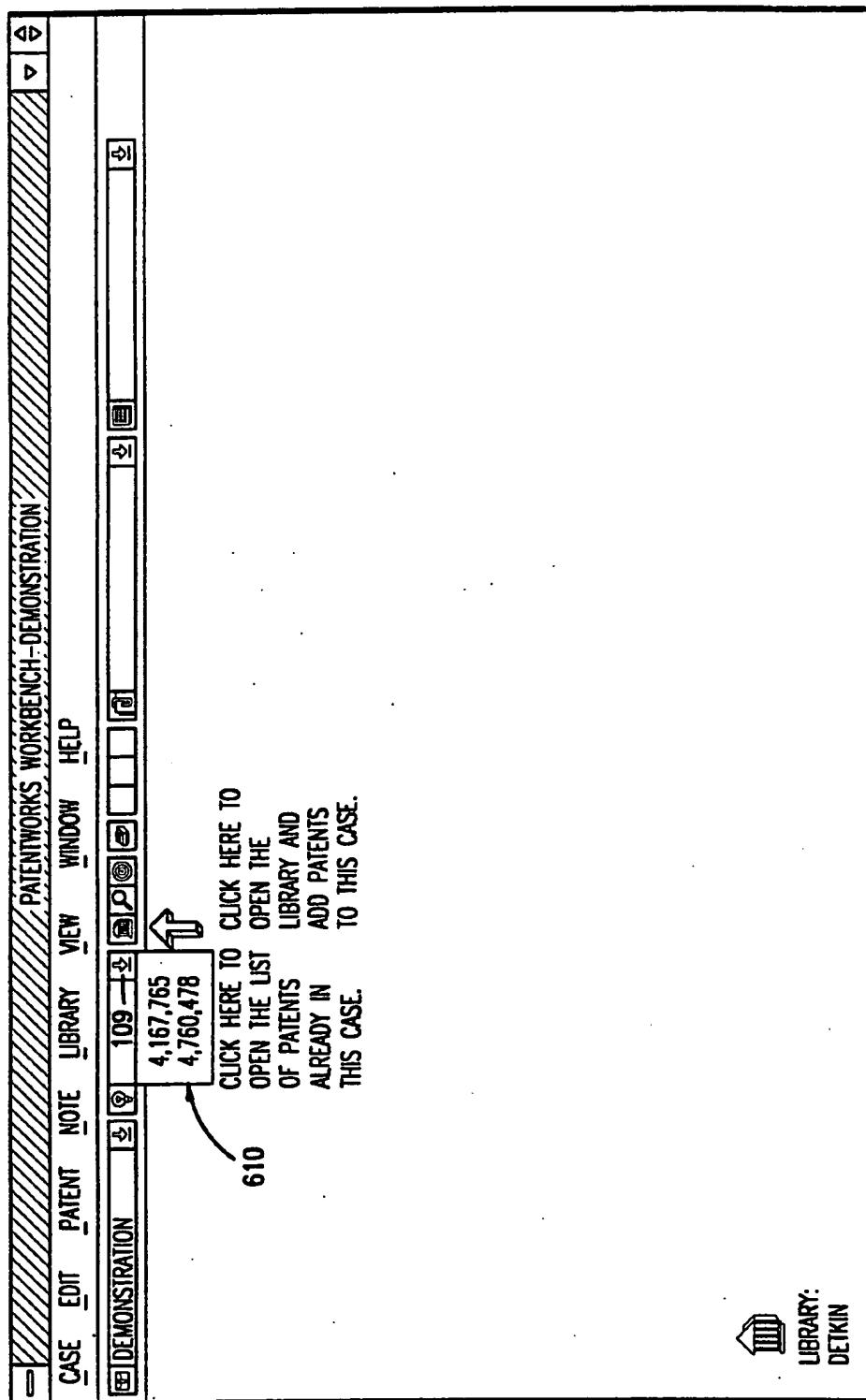


FIG.44

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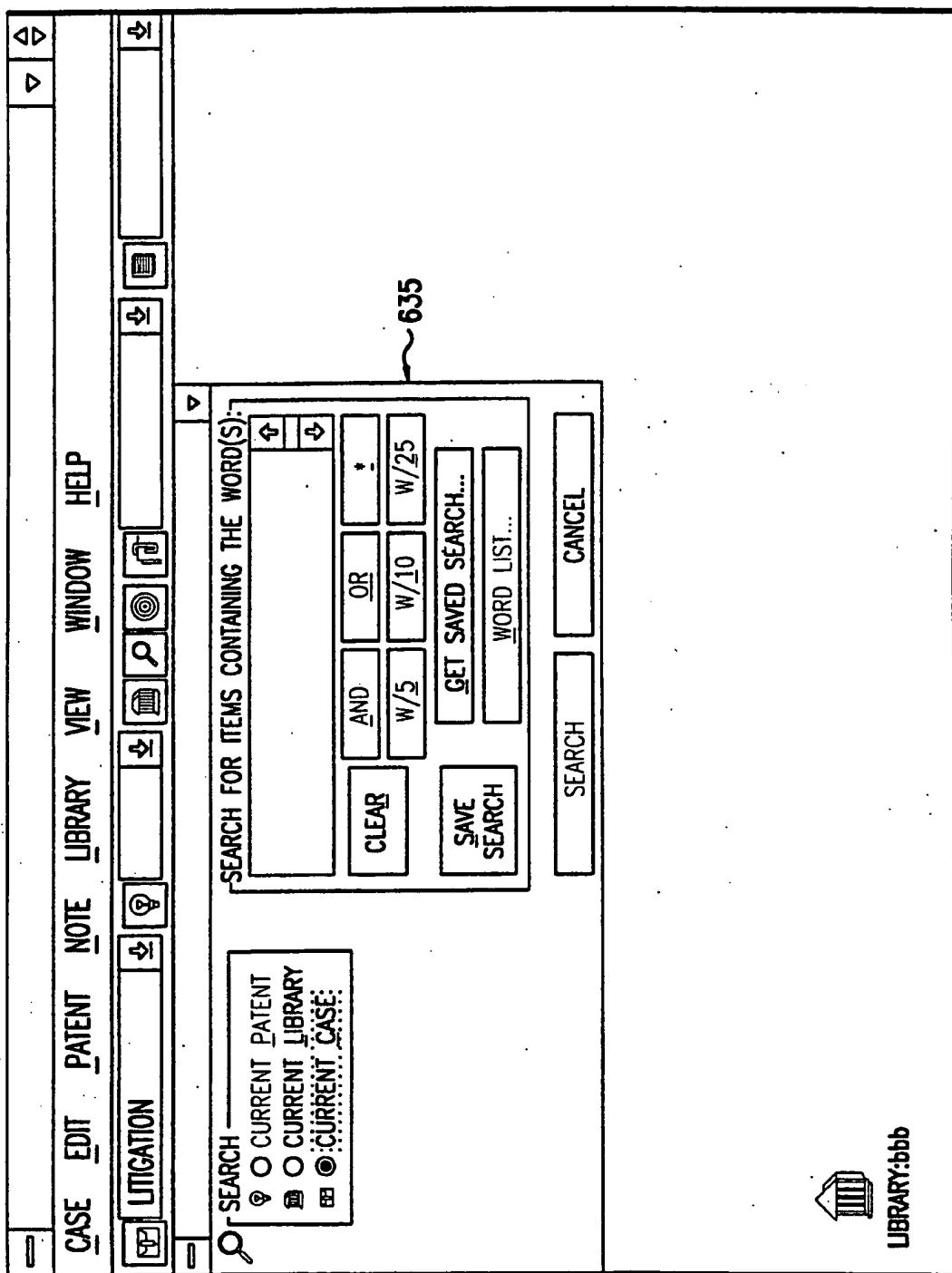
| PATENTWORKS WORKBENCH-DEMONSTRATION  |                          |                          |                          |                          |                          |                          |                          |                          |                          |
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| CASE   | EDIT                     | PATENT                   | NOTE                     | LIBRARY                  | VIEW                     | WINDOW                   | HELP                     |                          |                          |
| <input checked="" type="checkbox"/> DEMONSTRATION  | <input type="checkbox"/> |
| <p>— 4,760,478 COLUMN: B1 OF 6</p> <p>↑ ↓ B</p> <p>United States Patent [19]</p> <p>Pal et al.</p> <p>[11] Patent Number 4,760,478</p> <p>[45] Date of Patent: Jul. 26, 1988</p> <p>[54] VISCO-ELASTICALLY DAMPED MAGNETIC<br/>HEAD SUSPENSION ASSEMBLY</p> <p>[75] Inventor: George S. Pal, Sorologo, Cr; Charles G. Snyder, San Jose, CA</p> <p>[73] Assignee: International Business Machines, Armonk, NY</p> <p>[21] Appl. No.: 803,201</p> <p>[22] Filed: Jul. 8, 1986</p> <p>Related U.S. Application Data</p> <p>[63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.</p> <p>[51] Int. Cl. 4 G11B 5/48; G11B21/16</p> <p>[52] U.S. Cl. 360/104; 360/97</p> <p>[58] Field of Search... 360/102-106, 97-99,75,78</p> <p>[56] References Cited</p> <p>U.S. PATENT DOCUMENTS</p> <p>J.725,884 4/1973 Garlein.....340/174</p> |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| <p>— UPDATE CASE: DEMONSTRATION</p> <p>— CASE NAME: [DEMOCRATRON]</p> <p>ATTORNEY NAME: WENDELL HOLMES</p> <p>CLIENT NAME: [ ]</p> <p>DATE OPENED: 09/14/93</p> <p>OK CANCEL</p>   |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| <p>615</p> <p>620</p>  |                          |                          |                          |                          |                          |                          |                          |                          |                          |

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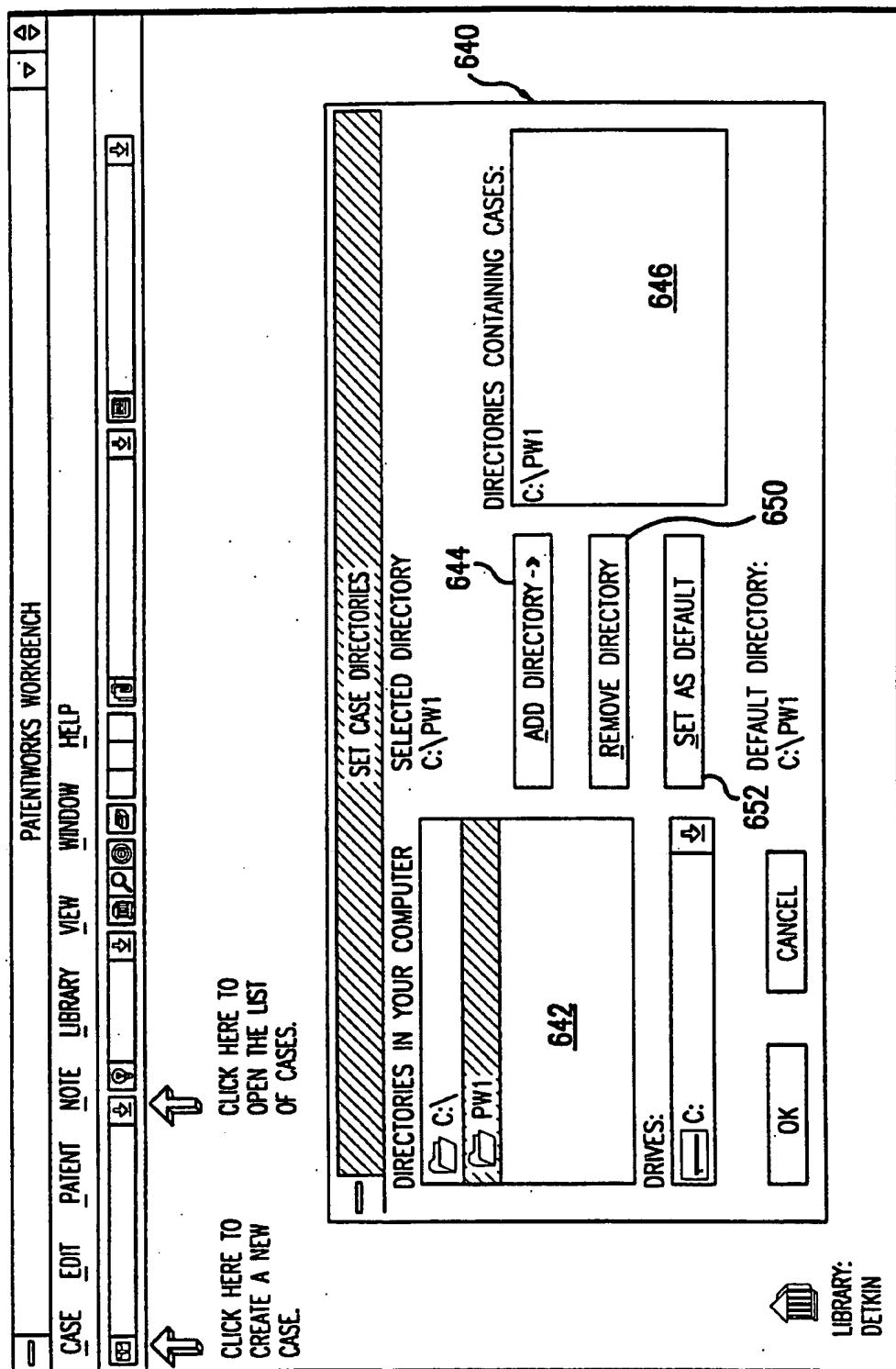
FIG. 45

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FIG. 46



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FIG.47

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FIG. 48

| PATENTWORKS WORKBENCH-DEMONSTRATION  |                                  |
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| CASE   | EDIT                             |
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| <input type="checkbox"/> HELP  |                                  |
| 4,760,478 COLUMN: B1 OF 6  |                                  |
| United States Patent [19]<br>Ptl et al.<br>[11] Patent Number 4,760,478<br>[45] Date of Patent: Jul. 26, 1988  |                                  |
| [54] VISCO-ELASTICALLY DAMPED MAGNETIC<br>HEAD SUSPENSION ASSEMBLY<br>[75] Inventor: George S. Ptl.<br>Snyder, San Jo  |                                  |
| [73] Assignee: International B<br>NY   |                                  |
| [21] Appl. No.: 883,201      COPY: 702<br>[22] Filed: Jul. 8, 1986      704 <input checked="" type="checkbox"/> CASE NOTES<br>Related U.S. Application 706 <input checked="" type="checkbox"/> PATENTS<br>[63] Continuation of Ser. No. 708 <input checked="" type="checkbox"/> PATENT NOTES<br>abandoned. |                                  |
| [51] Int. Cl. 4..... G11B 5/48; G11B21/16      B<br>[52] U.S. Cl. .... 360/104; 360/97<br>[58] Field of Search.... 360/102-106, 97-99,75,78      B<br>[56] References Cited<br>U.S. PATENT DOCUMENTS<br>3,725,884 4/1973 Gordin..... 340/174   |                                  |

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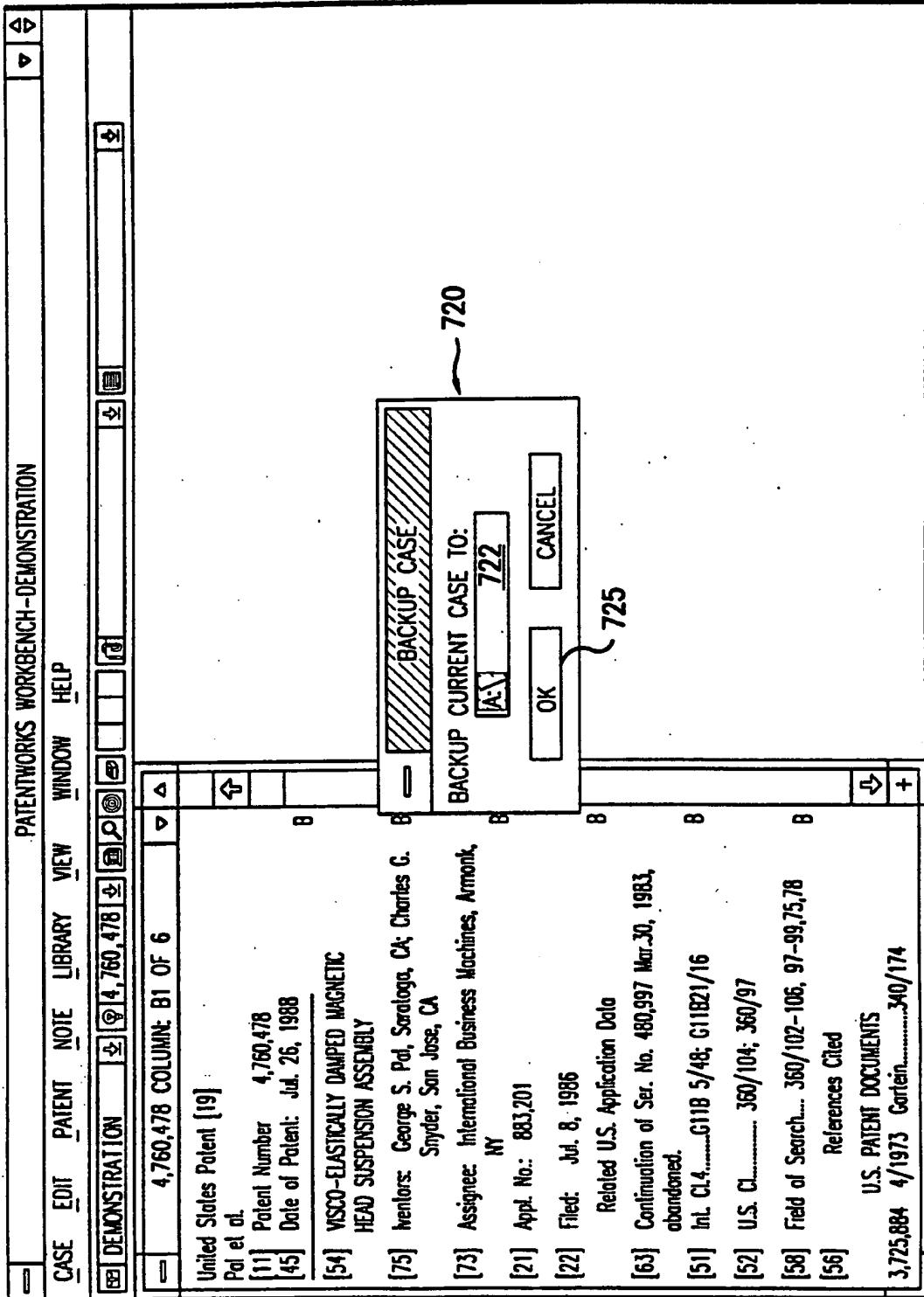
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FIG. 49



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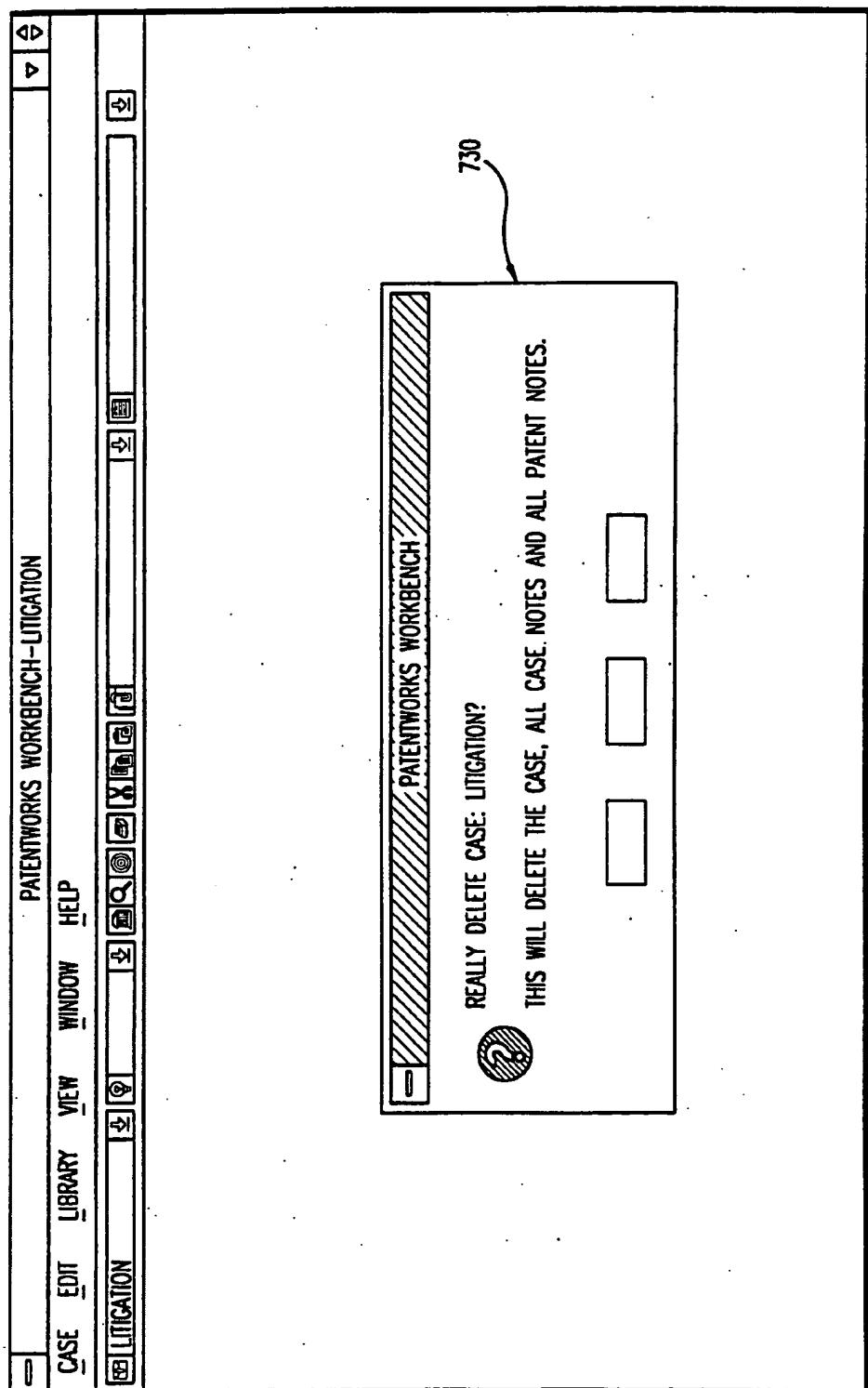


FIG.50

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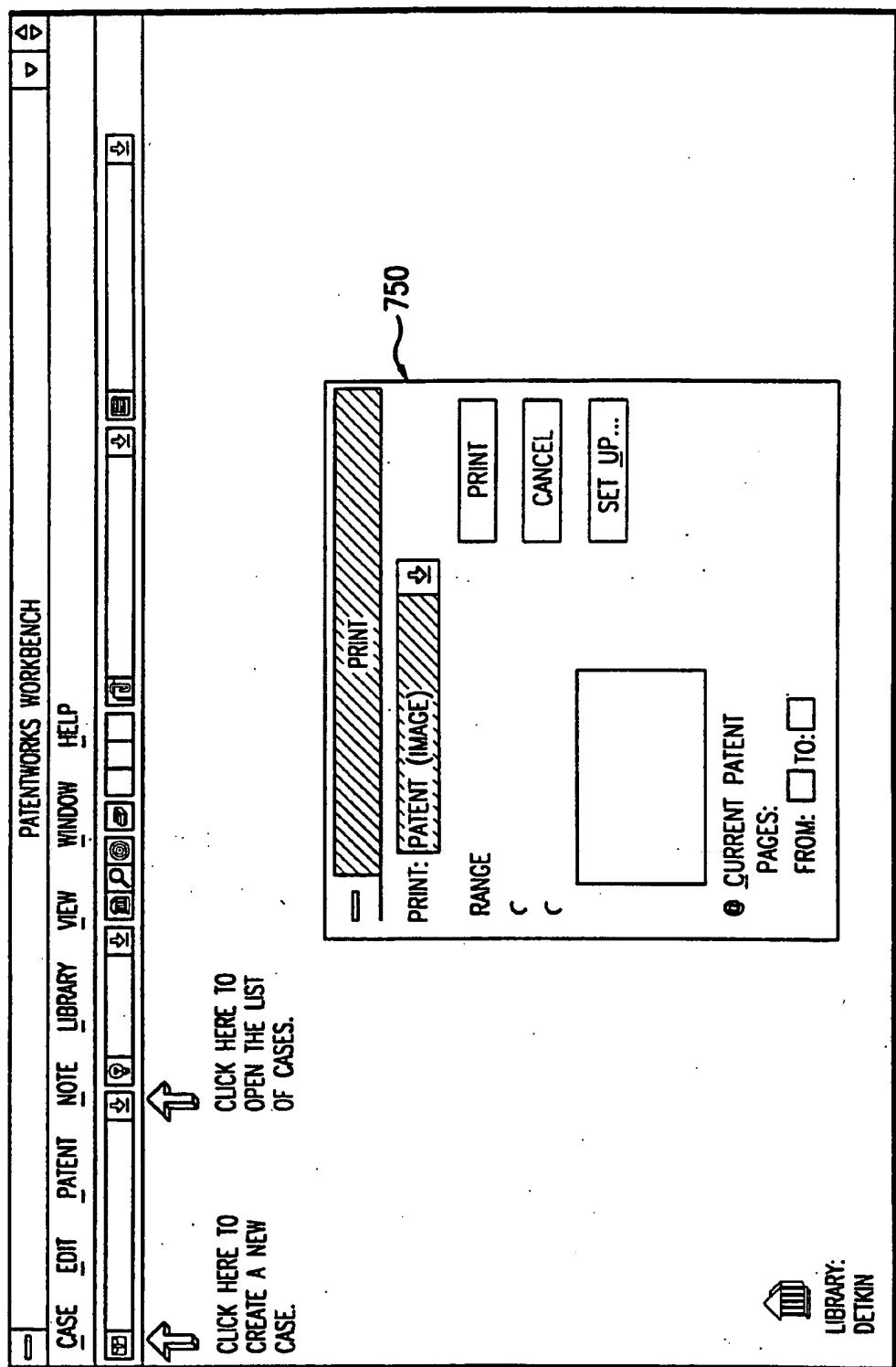
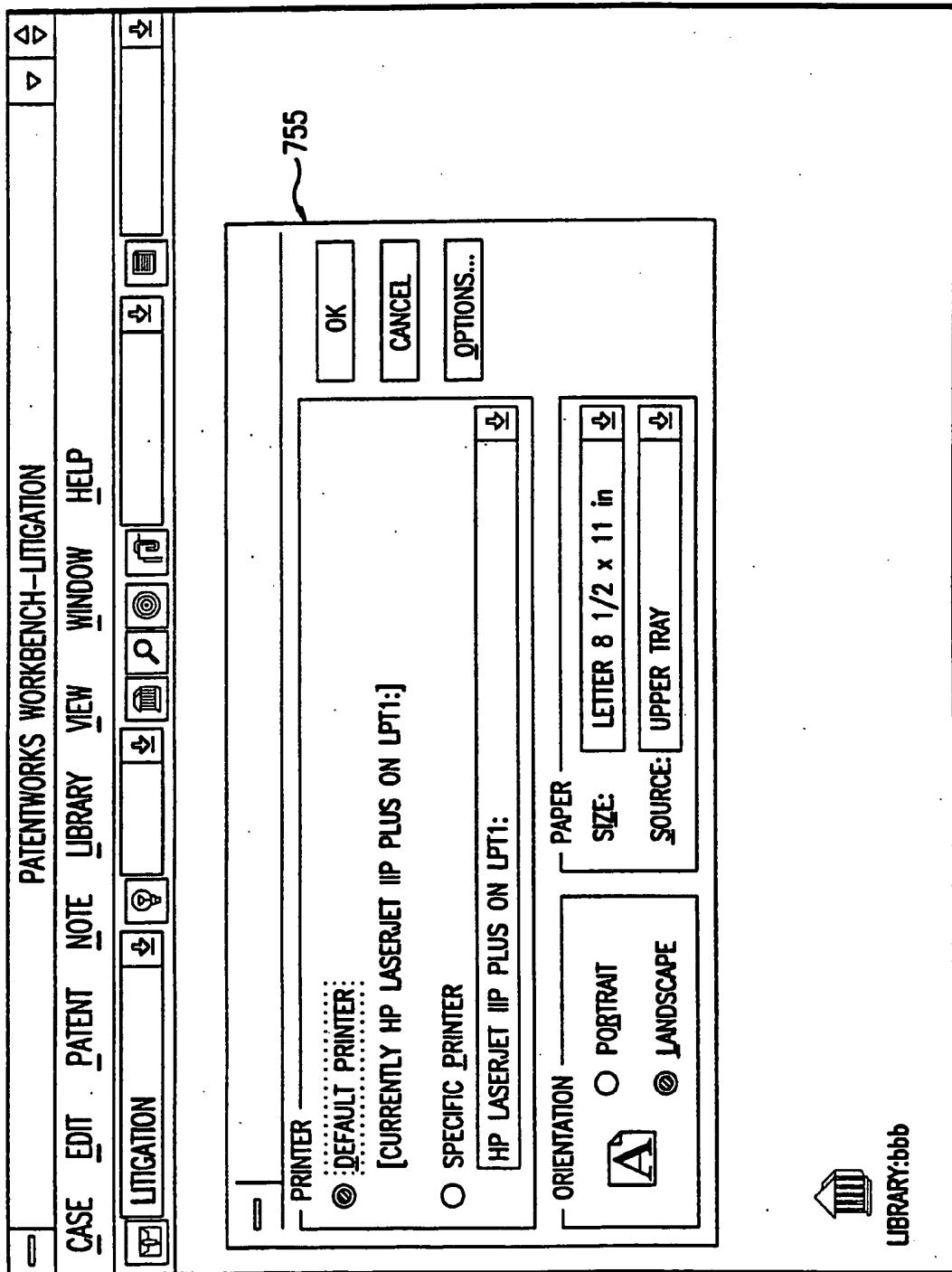


FIG.51

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FIG. 52



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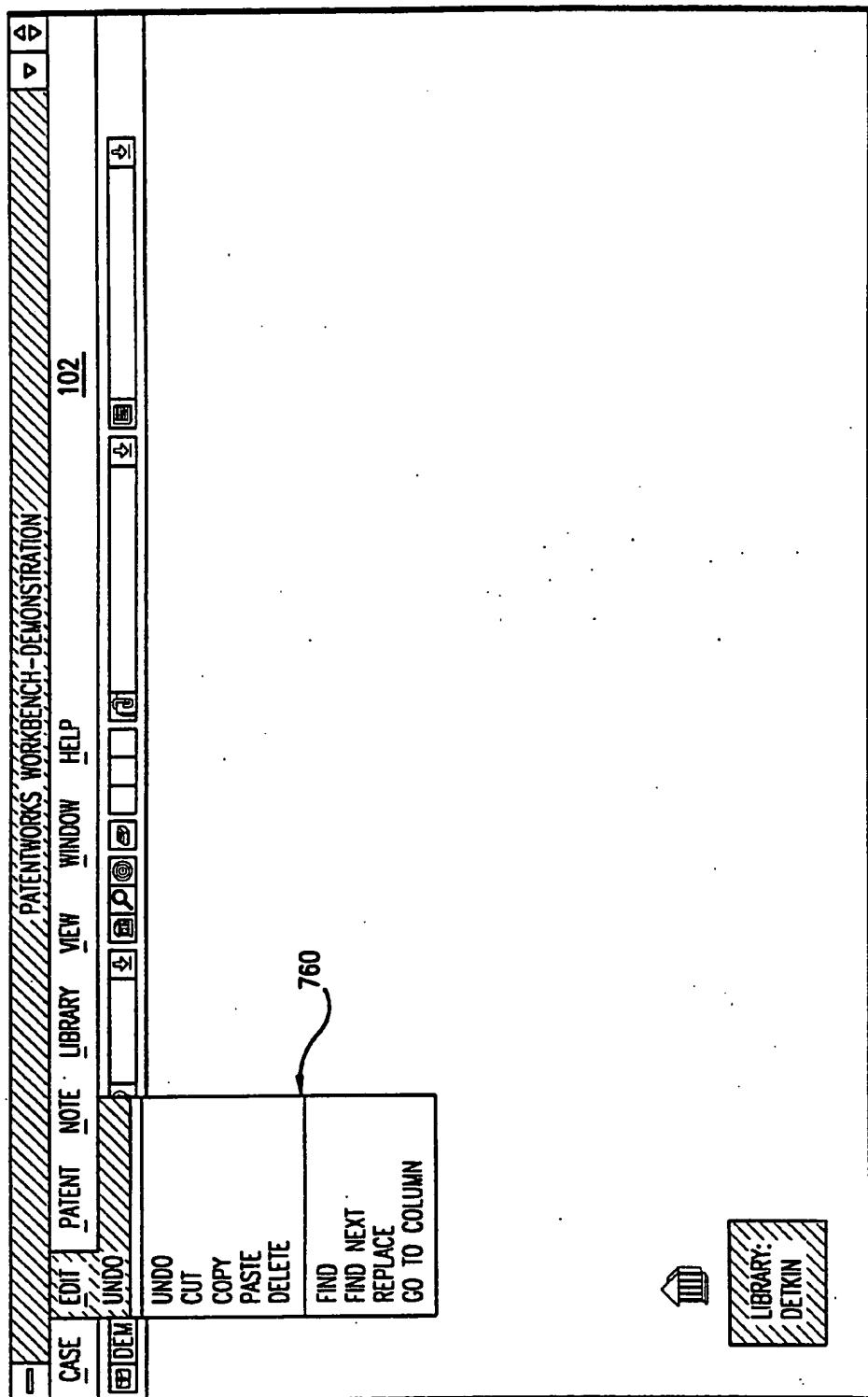


FIG.53

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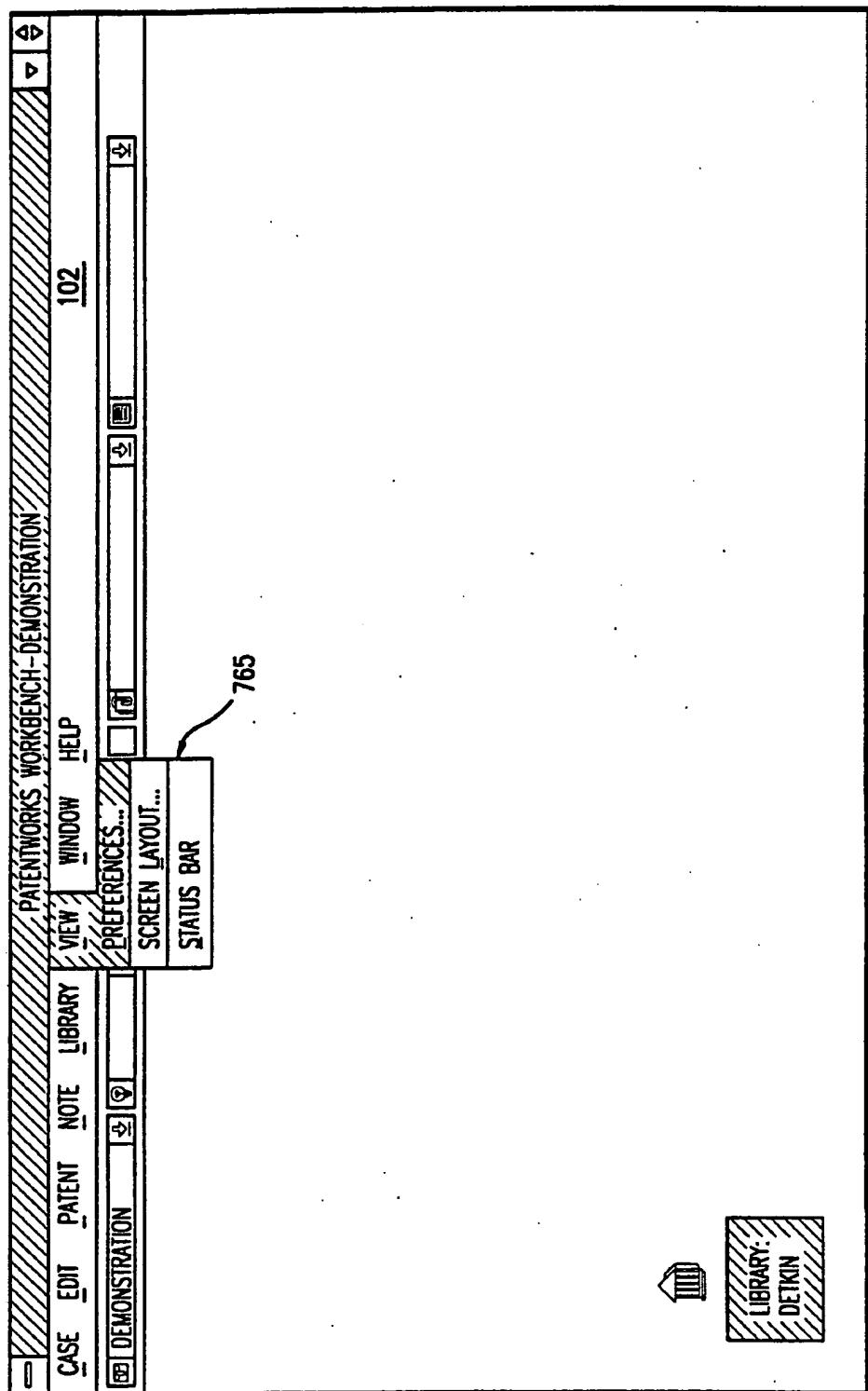


FIG. 54

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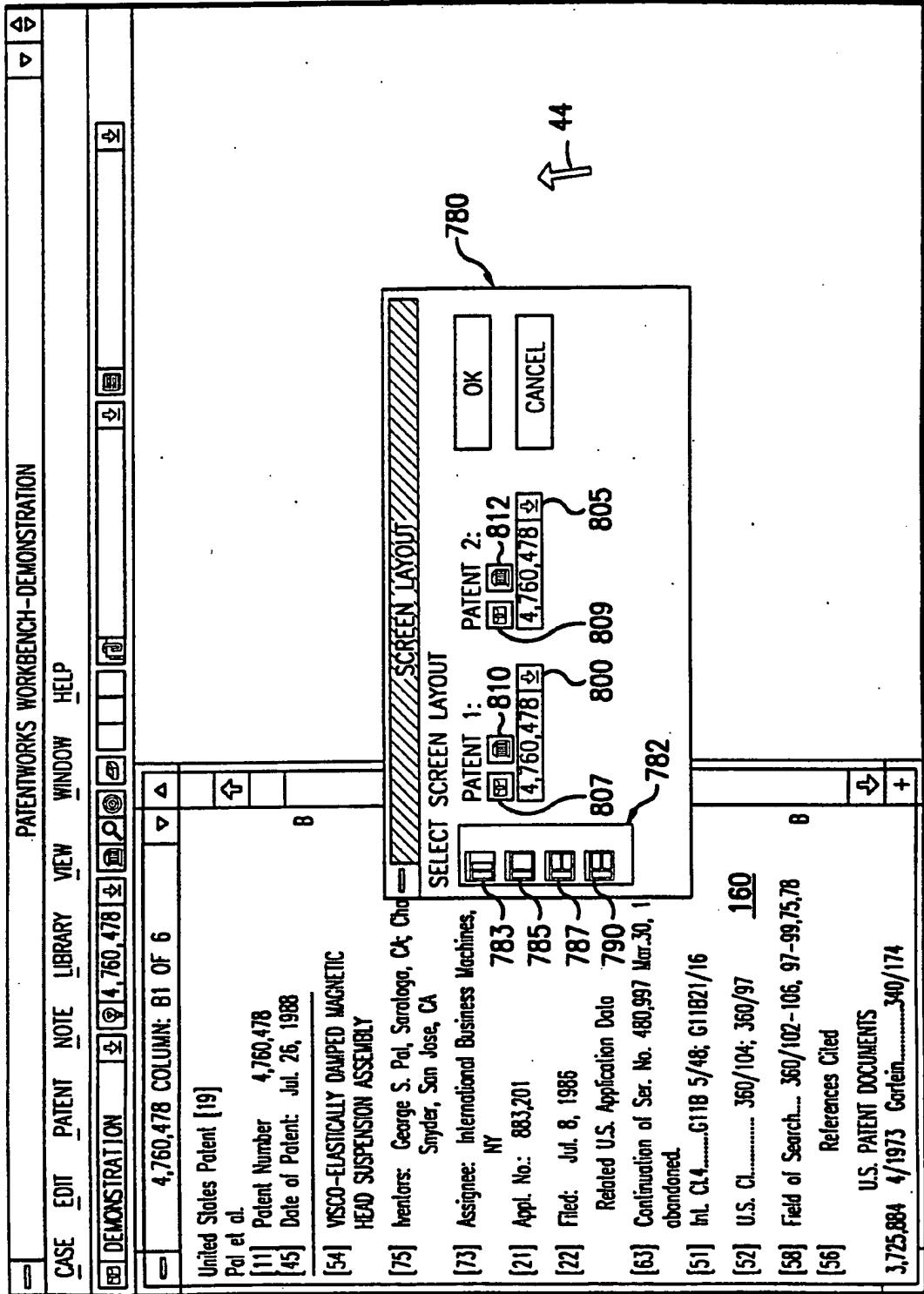
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FIG. 55

| PATENTWORKS WORKBENCH-DEMONSTRATION   |   |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
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| CASE  | EDIT  | PATENT  | NOTE                                | LIBRARY                             | VIEW                                | WINDOW                              | HELP                                |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| <input checked="" type="checkbox"/> DEMONSTRATION   |   | <input checked="" type="checkbox"/> 4,760,478 | <input checked="" type="checkbox"/> |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| <table border="1"> <tr> <td>—</td> <td>4,760,478 COLUMN: B1 OF 6</td> <td>▼</td> <td>▲</td> </tr> <tr> <td colspan="4">           United States Patent [19]<br/>           Pal et al.<br/>           [11] Patent Number 4,760,478<br/>           [45] Date of Patent: Jul. 26, 1988         </td> </tr> <tr> <td colspan="4">           [54] VISCO-ELASTICALLY DAMPED MAGNETIC<br/>           HEAD SUSPENSION ASSEMBLY         </td> </tr> <tr> <td colspan="4">           [75] Inventors: George S. Pal, Sorologa, CA; Charles G. Snyder, San Jose, CA         </td> </tr> <tr> <td colspan="4">           [73] Assignee: International Business Machines, Armonk, NY         </td> </tr> <tr> <td>[21]</td> <td>Appl. No.: 883,201</td> <td colspan="2">160</td> </tr> <tr> <td>[22]</td> <td>Filed: Jul. 8, 1986</td> <td colspan="2"></td> </tr> <tr> <td colspan="4">Related U.S. Application Data</td> </tr> <tr> <td colspan="4">[63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.</td> </tr> <tr> <td>[51]</td> <td>Int. Cl. 4, G11B 5/48; G11B21/16</td> <td colspan="2"></td> </tr> <tr> <td>[52]</td> <td>U.S. Cl. 360/104; 360/97</td> <td colspan="2"></td> </tr> <tr> <td>[58]</td> <td>Field of Search... 360/102-106, 97-99, 75, 78</td> <td colspan="2"></td> </tr> <tr> <td>[56]</td> <td>References Cited</td> <td colspan="2"></td> </tr> <tr> <td colspan="4">U.S. PATENT DOCUMENTS</td> </tr> <tr> <td colspan="4">3,725,884 4/1973 Gartlein..... 340/174</td> </tr> </table> |   |   |                                     |                                     |                                     |                                     |                                     | — | 4,760,478 COLUMN: B1 OF 6 | ▼ | ▲ | United States Patent [19]<br>Pal et al.<br>[11] Patent Number 4,760,478<br>[45] Date of Patent: Jul. 26, 1988 |  |  |  | [54] VISCO-ELASTICALLY DAMPED MAGNETIC<br>HEAD SUSPENSION ASSEMBLY |  |  |  | [75] Inventors: George S. Pal, Sorologa, CA; Charles G. Snyder, San Jose, CA |  |  |  | [73] Assignee: International Business Machines, Armonk, NY |  |  |  | [21] | Appl. No.: 883,201 | 160 |  | [22] | Filed: Jul. 8, 1986 |  |  | Related U.S. Application Data |  |  |  | [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned. |  |  |  | [51] | Int. Cl. 4, G11B 5/48; G11B21/16 |  |  | [52] | U.S. Cl. 360/104; 360/97 |  |  | [58] | Field of Search... 360/102-106, 97-99, 75, 78 |  |  | [56] | References Cited |  |  | U.S. PATENT DOCUMENTS |  |  |  | 3,725,884 4/1973 Gartlein..... 340/174 |  |  |  |
| —   | 4,760,478 COLUMN: B1 OF 6                     | ▼   | ▲                                   |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| United States Patent [19]<br>Pal et al.<br>[11] Patent Number 4,760,478<br>[45] Date of Patent: Jul. 26, 1988   |   |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [54] VISCO-ELASTICALLY DAMPED MAGNETIC<br>HEAD SUSPENSION ASSEMBLY  |   |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [75] Inventors: George S. Pal, Sorologa, CA; Charles G. Snyder, San Jose, CA  |   |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [73] Assignee: International Business Machines, Armonk, NY  |   |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [21]  | Appl. No.: 883,201                            | 160   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [22]  | Filed: Jul. 8, 1986                           |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| Related U.S. Application Data   |   |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.   |   |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [51]  | Int. Cl. 4, G11B 5/48; G11B21/16              |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [52]  | U.S. Cl. 360/104; 360/97                      |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [58]  | Field of Search... 360/102-106, 97-99, 75, 78 |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| [56]  | References Cited                              |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| U.S. PATENT DOCUMENTS   |   |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |
| 3,725,884 4/1973 Gartlein..... 340/174  |   |   |                                     |                                     |                                     |                                     |                                     |   |                           |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |                    |     |  |      |                     |  |  |                               |  |  |  |   |  |  |  |      |                                  |  |  |      |                          |  |  |      |   |  |  |      |                  |  |  |                       |  |  |  |  |  |  |  |

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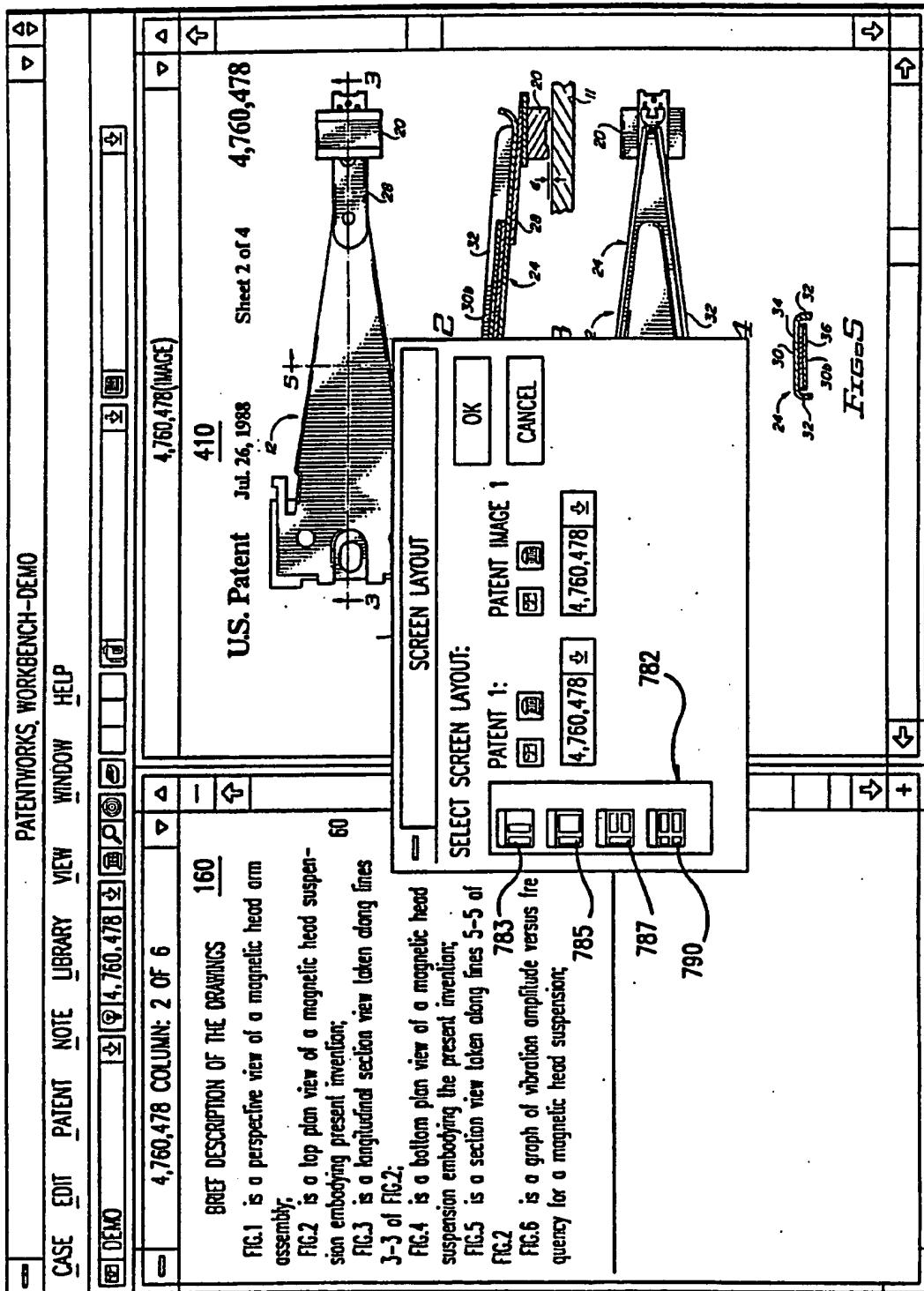


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FIG.56

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FIG. 57



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FIG. 58

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| PATENTWORKS WORK |      | BIBLIOGRAPHY |      |         |      |        |      |
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**SUBSTITUTE SHEET (RULE 26)**

FIG. 59

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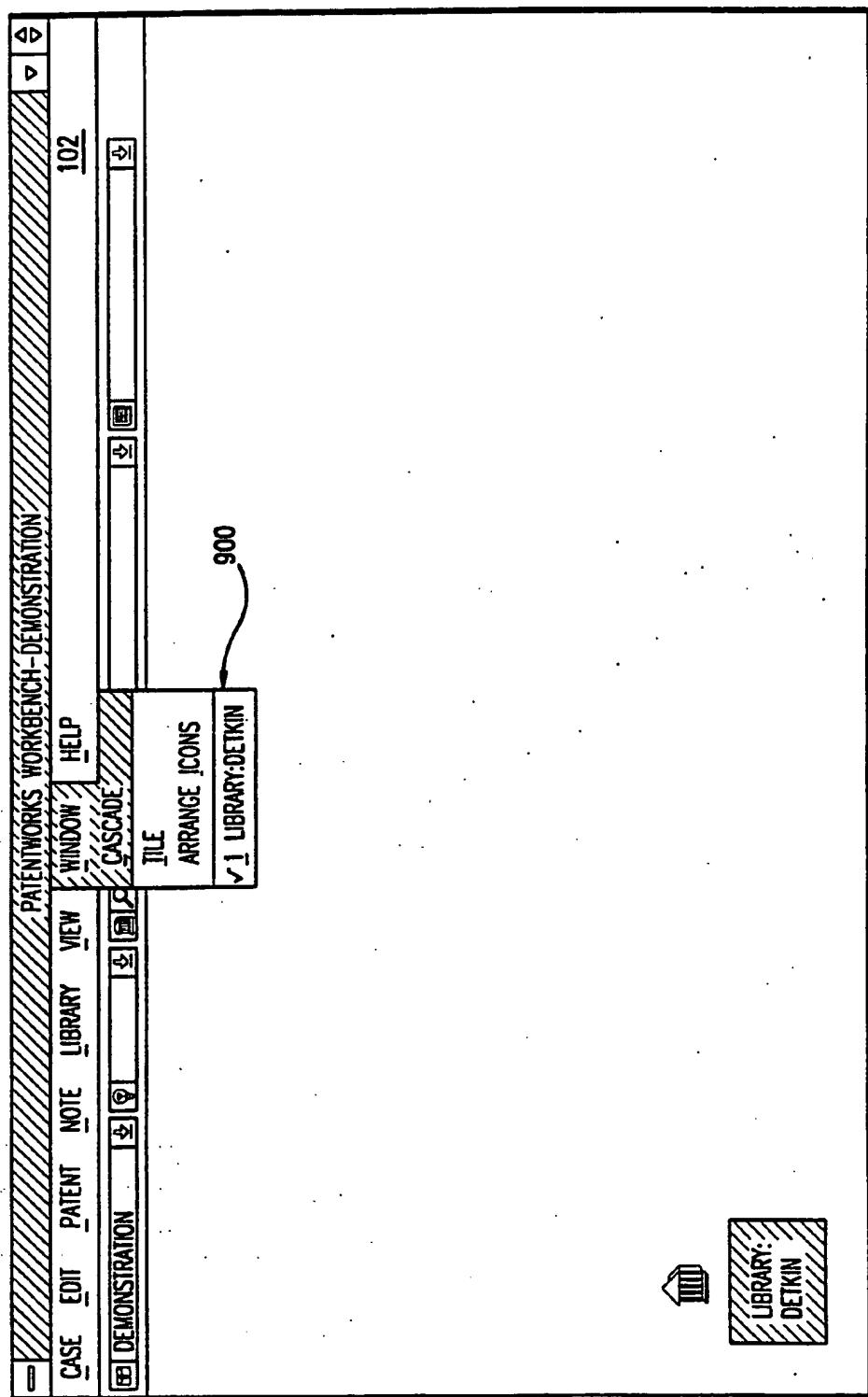
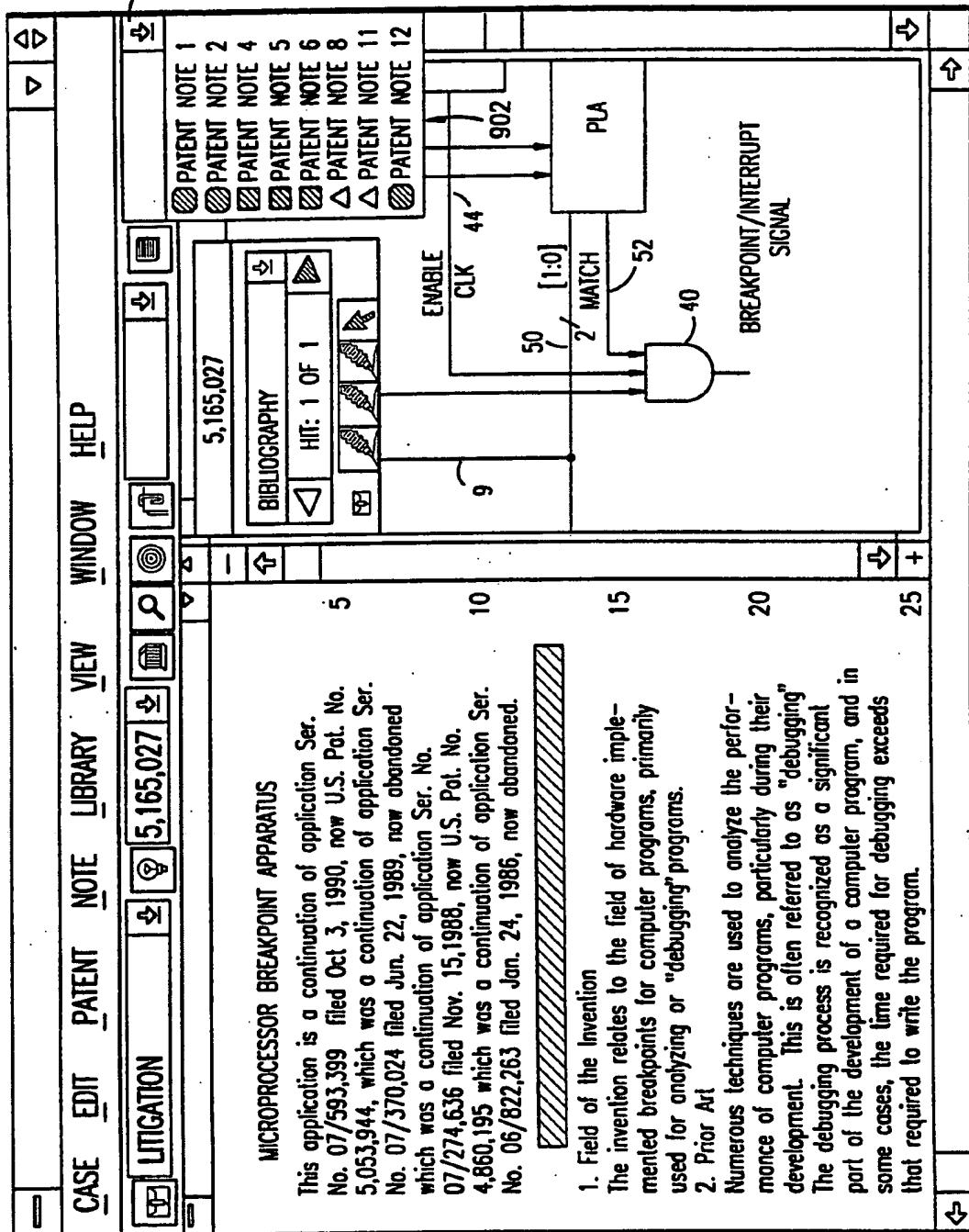


FIG. 60

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**SUBSTITUTE SHEET (RULE 26)**

FIG. 61

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| CASE   | EDIT                     | PATENT                   | NOTE                     | LIBRARY                  | VIEW                     | WINDOW                   | HELP                     |      |               |           |                          |      |                 |              |                          |   |  |  |  |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |
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| = 4,760,478 COLUMN: B1 OF 6 ▲ ▼  |                          |                          |                          |                          |                          |                          |                          |      |               |           |                          |      |                 |              |                          |   |  |  |  |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |
| <p>United States Patent [19]<br/>Pol et al.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">[11]</td> <td>Patent Number</td> <td>4,760,478</td> <td><input type="checkbox"/></td> </tr> <tr> <td>[45]</td> <td>Date of Patent:</td> <td>Jul 26, 1988</td> <td><input type="checkbox"/></td> </tr> <tr> <td colspan="4" style="text-align: center;">B</td> </tr> <tr> <td colspan="4"> <p>[54] VISCO-ELASTICALLY DAMPED MAGNETIC<br/>HEAD SUSPENSION ASSEMBLY</p> <p>[75] Inventors: George S. Pol, Saratoga, CA; Charles G. Snyder, San Jose, CA</p> <p>[73] Assignee: International Business Machines, Armonk, NY</p> <p>[21] Appl. No.: 883,201</p> <p>[22] Filed: Jul 8, 1986</p> <p style="text-align: right;">B</p> </td> </tr> <tr> <td colspan="4" style="text-align: center;">B</td> </tr> <tr> <td colspan="4"> <p>Related U.S. Application Data</p> <p>[63] Continuation of Ser. No. 480,997 Mar.30, 1983,<br/>abandoned.</p> <p>[51] Int. Cl. 41 G11B 5/48; G11B21/16</p> <p>[52] U.S. Cl. 360/104; 360/97</p> <p>[58] Field of Search... 360/102-106, 97-99,75,78</p> <p>[56] References Cited</p> <p>U.S. PATENT DOCUMENTS</p> <p>J,725,884 4/1973 Gertlein.....340/174</p> </td> </tr> <tr> <td colspan="4" style="text-align: right;"> <input type="button" value="OK"/> <input type="button" value="CANCEL"/> <input type="button" value="DELETE"/> <input type="button" value="SAVE"/> </td> </tr> </table> |                          |                          |                          |                          |                          |                          |                          | [11] | Patent Number | 4,760,478 | <input type="checkbox"/> | [45] | Date of Patent: | Jul 26, 1988 | <input type="checkbox"/> | B |  |  |  | <p>[54] VISCO-ELASTICALLY DAMPED MAGNETIC<br/>HEAD SUSPENSION ASSEMBLY</p> <p>[75] Inventors: George S. Pol, Saratoga, CA; Charles G. Snyder, San Jose, CA</p> <p>[73] Assignee: International Business Machines, Armonk, NY</p> <p>[21] Appl. No.: 883,201</p> <p>[22] Filed: Jul 8, 1986</p> <p style="text-align: right;">B</p> |  |  |  | B |  |  |  | <p>Related U.S. Application Data</p> <p>[63] Continuation of Ser. No. 480,997 Mar.30, 1983,<br/>abandoned.</p> <p>[51] Int. Cl. 41 G11B 5/48; G11B21/16</p> <p>[52] U.S. Cl. 360/104; 360/97</p> <p>[58] Field of Search... 360/102-106, 97-99,75,78</p> <p>[56] References Cited</p> <p>U.S. PATENT DOCUMENTS</p> <p>J,725,884 4/1973 Gertlein.....340/174</p> |  |  |  | <input type="button" value="OK"/> <input type="button" value="CANCEL"/> <input type="button" value="DELETE"/> <input type="button" value="SAVE"/> |  |  |  |
| [11]   | Patent Number            | 4,760,478                | <input type="checkbox"/> |                          |                          |                          |                          |      |               |           |                          |      |                 |              |                          |   |  |  |  |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |
| [45]   | Date of Patent:          | Jul 26, 1988             | <input type="checkbox"/> |                          |                          |                          |                          |      |               |           |                          |      |                 |              |                          |   |  |  |  |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |
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| B  |                          |                          |                          |                          |                          |                          |                          |      |               |           |                          |      |                 |              |                          |   |  |  |  |  |  |  |  |   |  |  |  |   |  |  |  |   |  |  |  |
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**SUBSTITUTE SHEET (RULE 26)**

FIG. 62

62/80

| CASE   | EDIT  | PATENT  | NOTE                     | LIBRARY                     | VIEW                            | WINDOW                        | HELP                            |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
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| <input type="checkbox"/> DEMONSTRATION   | <input type="checkbox"/>                                      | <input type="checkbox"/> 4,760,478                            | <input type="checkbox"/> | <input type="checkbox"/>    | <input type="checkbox"/>        | <input type="checkbox"/>      | <input type="checkbox"/>        |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| <table border="1"> <tr> <td colspan="2"> <input type="checkbox"/> PATENT NOTE 3           </td> <td colspan="2"> <input type="checkbox"/> ATTORNEY WORK PRODUCT           </td> </tr> <tr> <td colspan="4"> <input type="checkbox"/> FIRST NOTE HERE - CLICKING ON THE SHAPE TO THE PLACE<br/>           C: B1 THE LEFT WILL SCROLL THE TEXT TO THE PLACE<br/>           L: 13 OF THE NOTE AND THE HIGHLIGHT IS INTENSIFIED!<br/> <br/> <input type="checkbox"/> SECOND NOTE HERE - THESE NOTES CAN EXPAND<br/>           C: B1 TO FULL SIZE, AND THERE IS NO LIMIT TO THE<br/>           L: 20 AMOUNT OF TEXT THAT CAN BE ENTERED.         </td> </tr> <tr> <td colspan="4">           THIRD NOTE HERE -<br/> <br/>           C: B1 L: 29 THE FOLLOWING TEXT WAS DIRECTLY COPIED<br/>           FROM THE EQUIVALENT TEXT OF THE PATENT '478         </td> </tr> <tr> <td colspan="4">           909         </td> </tr> <tr> <td colspan="4">           U.S. PATENT DOCUMENTS<br/>           3,725,884 4/1973 GARTEN ..... 340/174<br/>           4,189,759 2/1980 BRUCK ET AL ..... 360/104         </td> </tr> <tr> <td colspan="4"> <input type="checkbox"/> 4,760,478           </td> <td><input type="checkbox"/> OK</td> <td><input type="checkbox"/> CANCEL</td> <td><input type="checkbox"/> SAVE</td> <td><input type="checkbox"/> DELETE</td> </tr> </table>  |   |   |                          |                             |                                 |                               |                                 | <input type="checkbox"/> PATENT NOTE 3 |  | <input type="checkbox"/> ATTORNEY WORK PRODUCT |  | <input type="checkbox"/> FIRST NOTE HERE - CLICKING ON THE SHAPE TO THE PLACE<br>C: B1 THE LEFT WILL SCROLL THE TEXT TO THE PLACE<br>L: 13 OF THE NOTE AND THE HIGHLIGHT IS INTENSIFIED!<br><br><input type="checkbox"/> SECOND NOTE HERE - THESE NOTES CAN EXPAND<br>C: B1 TO FULL SIZE, AND THERE IS NO LIMIT TO THE<br>L: 20 AMOUNT OF TEXT THAT CAN BE ENTERED. |  |  |  | THIRD NOTE HERE -<br><br>C: B1 L: 29 THE FOLLOWING TEXT WAS DIRECTLY COPIED<br>FROM THE EQUIVALENT TEXT OF THE PATENT '478 |               |           |  | 909  |                 |               |  | U.S. PATENT DOCUMENTS<br>3,725,884 4/1973 GARTEN ..... 340/174<br>4,189,759 2/1980 BRUCK ET AL ..... 360/104 |  |  |  | <input type="checkbox"/> 4,760,478                                 |  |  |  | <input type="checkbox"/> OK | <input type="checkbox"/> CANCEL | <input type="checkbox"/> SAVE                                 | <input type="checkbox"/> DELETE |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
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| 909  |   |   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
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| <table border="1"> <tr> <td colspan="2">           United States Patent [19]         </td> <td colspan="2">           160         </td> </tr> <tr> <td colspan="4">           Pat. et al.         </td> </tr> <tr> <td>[11]</td> <td>Patent Number</td> <td colspan="2">4,760,478</td> </tr> <tr> <td>[45]</td> <td>Date of Patent:</td> <td colspan="2">Jul. 26, 1988</td> </tr> <tr> <td colspan="4" style="text-align: center;">B</td> </tr> <tr> <td colspan="4">           [54] VISCO-ELASTICALLY DAMPED MAGNETIC<br/>           HEAD SUSPENSION ASSEMBLY         </td> </tr> <tr> <td>[75]</td> <td>Venors:</td> <td colspan="2">George S. Pat. Srlologia, CA; Charles G. Snyder, San Jose, CA</td> </tr> <tr> <td>[73]</td> <td>Assignee:</td> <td colspan="2">International Business Machines, Armonk, NY</td> </tr> <tr> <td>[21]</td> <td>Appl. No.:</td> <td colspan="2">883,201</td> </tr> <tr> <td>[22]</td> <td>Filed:</td> <td colspan="2">Jul. 8, 1986</td> </tr> <tr> <td colspan="4" style="text-align: center;">8</td> </tr> <tr> <td colspan="4">           Related U.S. Application Data         </td> </tr> <tr> <td>[63]</td> <td>Continuation of Ser. No. 480,907 Mar. 30, 1983,<br/>abandoned.</td> <td colspan="2"></td> </tr> <tr> <td>[51]</td> <td>Int. Cl. .... G11B 5/18</td> <td colspan="2">G11B21/16</td> </tr> <tr> <td>[52]</td> <td>U.S. Cl. .... 360/104, 360/97</td> <td colspan="2">B</td> </tr> <tr> <td>[58]</td> <td>Field of Search .... 360/102-106, 91-99, 75, 76</td> <td colspan="2">B</td> </tr> <tr> <td>[56]</td> <td>References Cited</td> <td colspan="2"></td> </tr> <tr> <td colspan="4">           U.S. PATENT DOCUMENTS<br/>           3,725,884 4/1973 Gartem ..... 340/174         </td> </tr> </table> |   |   |                          |                             |                                 |                               |                                 | United States Patent [19]              |  | 160  |  | Pat. et al.   |  |  |  | [11]   | Patent Number | 4,760,478 |  | [45] | Date of Patent: | Jul. 26, 1988 |  | B  |  |  |  | [54] VISCO-ELASTICALLY DAMPED MAGNETIC<br>HEAD SUSPENSION ASSEMBLY |  |  |  | [75]                        | Venors:                         | George S. Pat. Srlologia, CA; Charles G. Snyder, San Jose, CA |                                 | [73] | Assignee: | International Business Machines, Armonk, NY |  | [21] | Appl. No.: | 883,201 |  | [22] | Filed: | Jul. 8, 1986 |  | 8 |  |  |  | Related U.S. Application Data |  |  |  | [63] | Continuation of Ser. No. 480,907 Mar. 30, 1983,<br>abandoned. |  |  | [51] | Int. Cl. .... G11B 5/18 | G11B21/16 |  | [52] | U.S. Cl. .... 360/104, 360/97 | B |  | [58] | Field of Search .... 360/102-106, 91-99, 75, 76 | B |  | [56] | References Cited |  |  | U.S. PATENT DOCUMENTS<br>3,725,884 4/1973 Gartem ..... 340/174 |  |  |  |
| United States Patent [19]  |   | 160   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| Pat. et al.  |   |   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| [11]   | Patent Number   | 4,760,478   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| [45]   | Date of Patent:   | Jul. 26, 1988   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
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| [73]   | Assignee:   | International Business Machines, Armonk, NY                   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| [21]   | Appl. No.:  | 883,201   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| [22]   | Filed:  | Jul. 8, 1986  |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| 8  |   |   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| Related U.S. Application Data  |   |   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| [63]   | Continuation of Ser. No. 480,907 Mar. 30, 1983,<br>abandoned. |   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| [51]   | Int. Cl. .... G11B 5/18                                       | G11B21/16   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| [52]   | U.S. Cl. .... 360/104, 360/97                                 | B   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| [58]   | Field of Search .... 360/102-106, 91-99, 75, 76               | B   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| [56]   | References Cited  |   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |
| U.S. PATENT DOCUMENTS<br>3,725,884 4/1973 Gartem ..... 340/174   |   |   |                          |                             |                                 |                               |                                 |  |  |  |  |   |  |  |  |  |               |           |  |      |                 |               |  |  |  |  |  |  |  |  |  |                             |                                 |   |                                 |      |           |   |  |      |            |         |  |      |        |              |  |   |  |  |  |                               |  |  |  |      |   |  |  |      |                         |           |  |      |                               |   |  |      |   |   |  |      |                  |  |  |  |  |  |  |

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FIG. 63

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FIG. 64

| PATENTWORKS WORKBENCH-DEMONSTRATION                             |   |
|---|---|
| CASE  | EDIT  |
| <input checked="" type="checkbox"/> DEMONSTRATION               | <input type="checkbox"/> PATENT                               |
| <input type="checkbox"/> NOTE                                   | <input type="checkbox"/> LIBRARY                              |
| <input type="checkbox"/> VIEW                                   | <input type="checkbox"/> WINDOW                               |
| <input type="checkbox"/> HELP                                   |   |
| 4,760,478 COLUMN: B1 OF 6                                       |   |
| United States Patent [19]                                       |   |
| Pd et al.   |   |
| [11] Patent Number  | 4,760,478   |
| [45] Date of Patent:  | Jul 26, 1988  |
| B   |   |
| 160   |   |
| VISCO-ELASTICALLY DAMPED MAGNETIC                               |   |
| HEAD SUSPENSION ASSEMBLY  |   |
| [75] Inventor:  | George S. Pali, Saratoga, CA; Charles G. Snyder, San Jose, CA |
| [73] Assignee:  | International Business Machines, Armonk, NY                   |
| [21] Appl. No.:   | 883,201   |
| [22] Filed:   | Jul. 8, 1986  |
| B   |   |
| Related U.S. Application Data                                   |   |
| [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned. |   |
| [51] Int. Cl. 4   | G11B 5/48; G11B21/16  |
| [52] U.S. Cl.   | 360/104; 360/97   |
| [58] Field of Search...   | 360/102-106, 97-99, 75, 78                                    |
| [56] References Cited   |   |
| U.S. PATENT DOCUMENTS   |   |
| 3,725,884 4/1973 Gertlein 340/174                               |   |
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| SAVE  |   |
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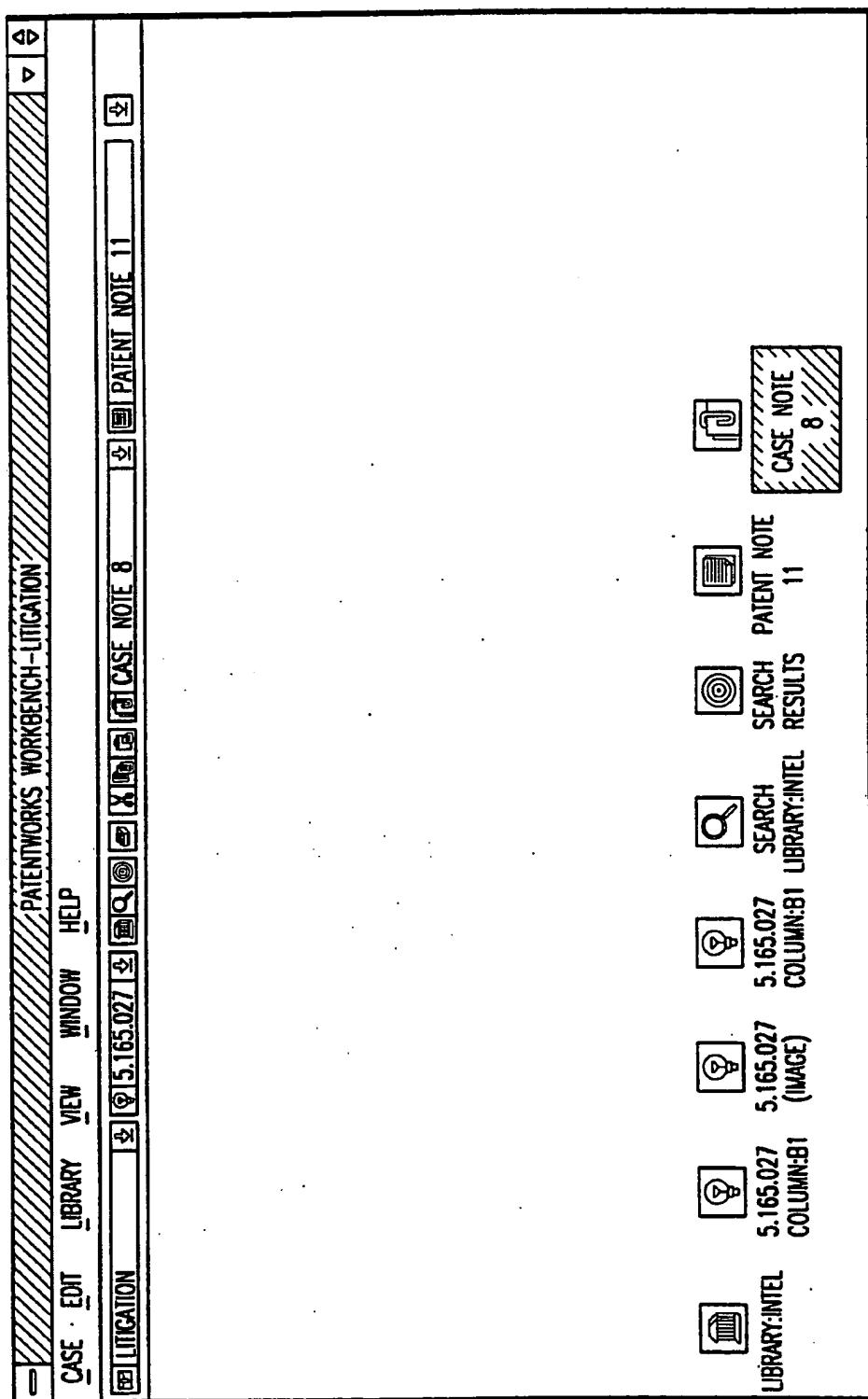
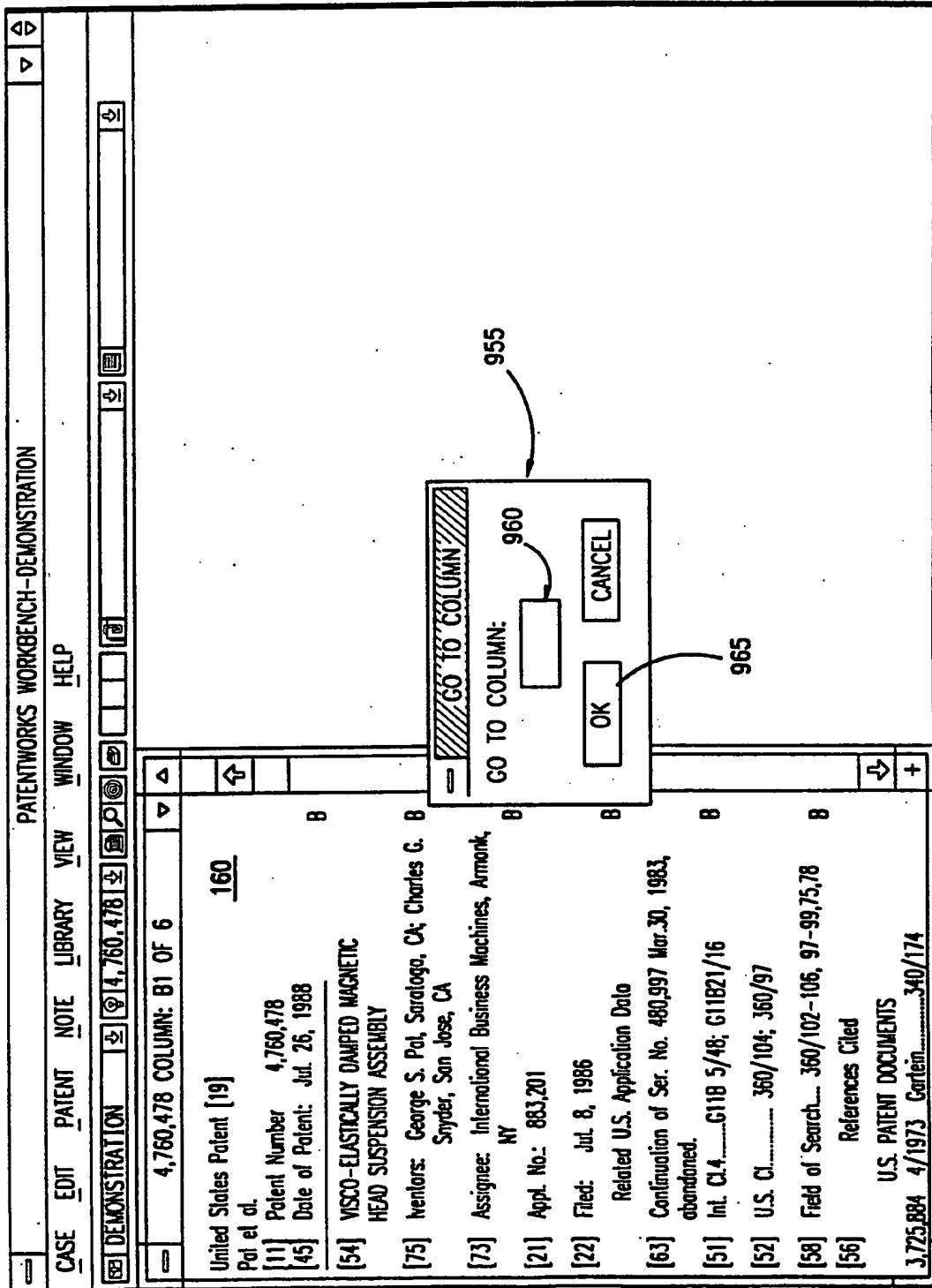


FIG. 65

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FIG.66



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FIG. 67

**PATENTWORKS WORKBENCH-DEMONSTRATION**

| CASE  |  | PATENT |  | NOTE |  | LIBRARY |  | VIEW |  | WINDOW |  | HELP  |  |   |  |   |  |   |  |   |  |   |  |
|---|--|--------|--|------|--|---------|--|------|--|--------|--|---|--|---|--|---|--|---|--|---|--|---|--|
| DEMONSTRATION   |  |        |  |      |  |         |  |      |  |        |  | [1] 4,760,478   |  | [2] 4,760,478   |  | [3] 4,760,478   |  | [4] 4,760,478   |  | [5] 4,760,478   |  | [6] 4,760,478   |  |
| [7] 4,760,478 COLUMN: B1 OF 6   |  |        |  |      |  |         |  |      |  |        |  | 160   |  | 160   |  | 160   |  | 160   |  | 160   |  |   |  |
| Pat. et. al.  |  |        |  |      |  |         |  |      |  |        |  | [1] Patent Number 4,760,478   |  | [45] Date of Patent: Jul. 26, 1988  |  | [6] 160   |  | [7] 160   |  | [8] 160   |  | [9] 160   |  |
| [54] VSICO-ELASTICALLY DAMPED MAGNETIC                                      |  |        |  |      |  |         |  |      |  |        |  | [54] VSICO-ELASTICALLY DAMPED MAGNETIC                                      |  |
| HEAD SUSPENSION ASSEMBLY  |  |        |  |      |  |         |  |      |  |        |  | HEAD SUSPENSION ASSEMBLY  |  |
| [75] Inventor: George S. Pol, Sonologo, Ct; Charles G. Snyder, San Jose, CA |  |        |  |      |  |         |  |      |  |        |  | [75] Inventor: George S. Pol, Sonologo, Ct; Charles G. Snyder, San Jose, CA |  | [75] Inventor: George S. Pol, Sonologo, Ct; Charles G. Snyder, San Jose, CA |  | [75] Inventor: George S. Pol, Sonologo, Ct; Charles G. Snyder, San Jose, CA |  | [75] Inventor: George S. Pol, Sonologo, Ct; Charles G. Snyder, San Jose, CA |  | [75] Inventor: George S. Pol, Sonologo, Ct; Charles G. Snyder, San Jose, CA |  | [75] Inventor: George S. Pol, Sonologo, Ct; Charles G. Snyder, San Jose, CA |  |
| [73] Assignee: International Business Machines, Armonk, NY                  |  |        |  |      |  |         |  |      |  |        |  | [73] Assignee: International Business Machines, Armonk, NY                  |  | [73] Assignee: International Business Machines, Armonk, NY                  |  | [73] Assignee: International Business Machines, Armonk, NY                  |  | [73] Assignee: International Business Machines, Armonk, NY                  |  | [73] Assignee: International Business Machines, Armonk, NY                  |  | [73] Assignee: International Business Machines, Armonk, NY                  |  |
| [21] Appl. No.: 883,201   |  |        |  |      |  |         |  |      |  |        |  | [21] Appl. No.: 883,201   |  |
| [22] Filed: Jul. 8, 1986  |  |        |  |      |  |         |  |      |  |        |  | [22] Filed: Jul. 8, 1986  |  |
| Ref'd U.S. Application Date   |  |        |  |      |  |         |  |      |  |        |  | Ref'd U.S. Application Date   |  |
| [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.             |  |        |  |      |  |         |  |      |  |        |  | [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.             |  | [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.             |  | [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.             |  | [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.             |  | [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.             |  | [63] Continuation of Ser. No. 480,997 Mar. 30, 1983, abandoned.             |  |
| [51] Int. Cl.4.....G11B 5/48; G11B21/16                                     |  |        |  |      |  |         |  |      |  |        |  | [51] Int. Cl.4.....G11B 5/48; G11B21/16                                     |  |
| [52] U.S. Cl.....360/104; 360/97  |  |        |  |      |  |         |  |      |  |        |  | [52] U.S. Cl.....360/104; 360/97  |  |
| [58] Field of Search.... 360/102-106; 97-99; 75; 78                         |  |        |  |      |  |         |  |      |  |        |  | [58] Field of Search.... 360/102-106; 97-99; 75; 78                         |  | [58] Field of Search.... 360/102-106; 97-99; 75; 78                         |  | [58] Field of Search.... 360/102-106; 97-99; 75; 78                         |  | [58] Field of Search.... 360/102-106; 97-99; 75; 78                         |  | [58] Field of Search.... 360/102-106; 97-99; 75; 78                         |  |   |  |
| [56] References Cited   |  |        |  |      |  |         |  |      |  |        |  | [56] References Cited   |  |
| U.S. PATENT DOCUMENTS   |  |        |  |      |  |         |  |      |  |        |  | U.S. PATENT DOCUMENTS   |  |
| 3,753,884 4/1973 Gartem.....340/174   |  |        |  |      |  |         |  |      |  |        |  | 3,753,884 4/1973 Gartem.....340/174   |  |

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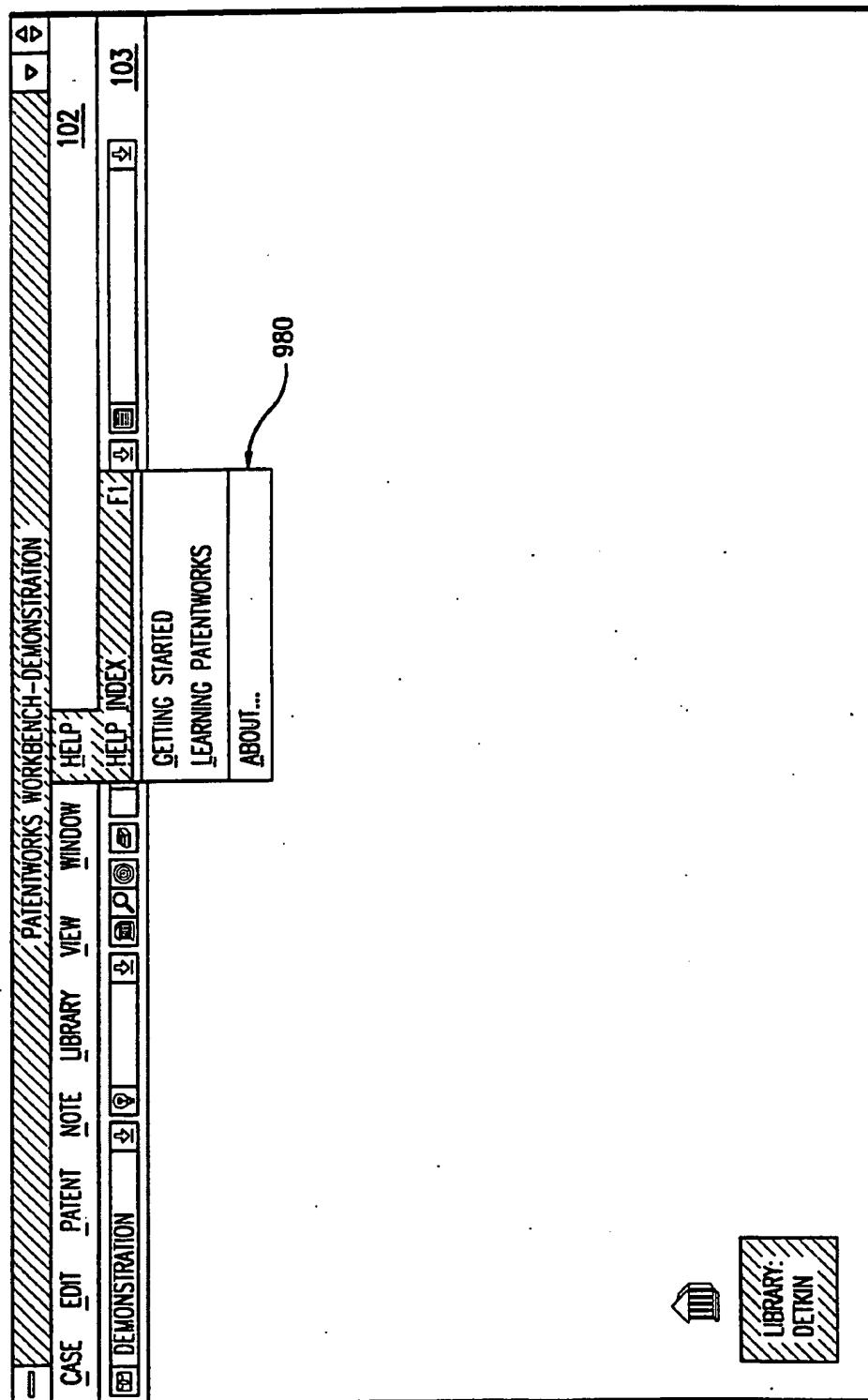


FIG. 68

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**SUBSTITUTE SHEET (RULE 26)**

FIG. 69

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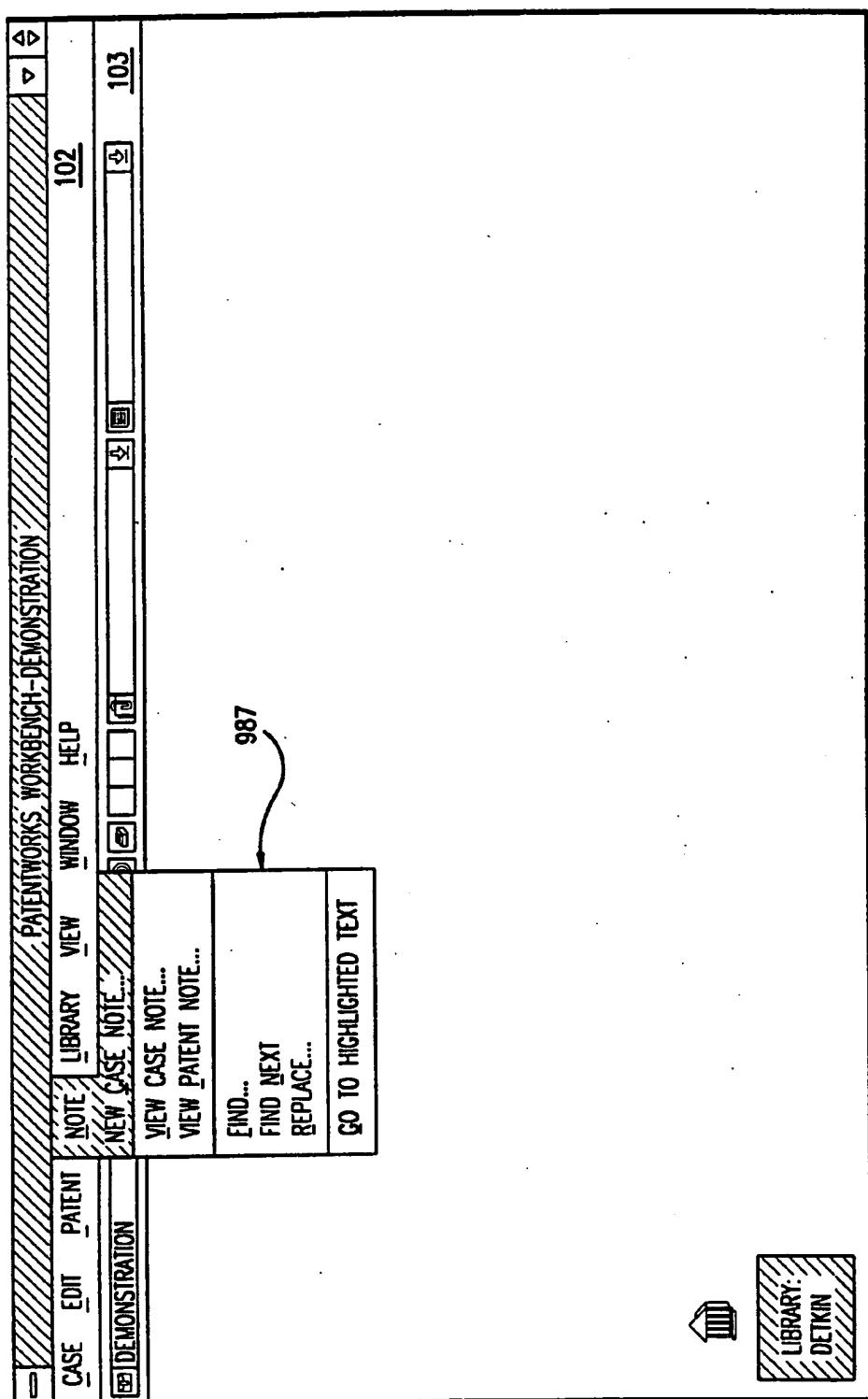


FIG.70

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**PATENTWORKS WORKBENCH-DEMONSTRATION**

| CASE   | EDIT  | PATENT   | NOTE                     | LIBRARY                  | VIEW                     | WINDOW                   | HELP                     |
|--|---|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input checked="" type="checkbox"/> DEMONSTRATION                  | <input type="checkbox"/>                      | <input type="checkbox"/>   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4,760,478 COLUMN: 81 OF 6  |   |  |                          |                          |                          |                          |                          |
| United States Patent [19]  |   |  |                          |                          |                          |                          |                          |
| Pat. el. d.  |   |  |                          |                          |                          |                          |                          |
| [11]   | Patent Number                                 | 4,760,478  |                          |                          |                          |                          |                          |
| [45]   | Date of Patent:                               | Jul. 26, 1988  |                          |                          |                          |                          |                          |
| [54] VISCO-ELASTICALLY DAMPED MAGNETIC<br>HEAD SUSPENSION ASSEMBLY |   |  |                          |                          |                          |                          |                          |
| [75]   | Inventors:                                    | George S. Patl, Stratologic, Ct; Charles<br>Snyder, San Jose, CA |                          |                          |                          |                          |                          |
| [73]   | Assignee:                                     | International Business Machines, Ar<br>NY                        |                          |                          |                          |                          |                          |
| [21]   | Appl. No.:                                    | 883,201  |                          |                          |                          |                          |                          |
| [22]   | Filed:  | Jul. 8, 1986   |                          |                          |                          |                          |                          |
| Related U.S. Application Data                                      |   |  |                          |                          |                          |                          |                          |
| [63]   | Continuation of Ser. No. 480,997 Mar. 30, 198 |  |                          |                          |                          |                          |                          |
| abandoned.   |   |  |                          |                          |                          |                          |                          |
| [51]   | Int. Cl. 4                                    | G11B 5/48; G11B21/16   |                          |                          |                          |                          |                          |
| [52]   | U.S. Cl.                                      | 360/104; 360/97  |                          |                          |                          |                          |                          |
| [58]   | Field of Search...                            | 360/102-106, 97-99, 75, 78                                       |                          |                          |                          |                          |                          |
| [56]   | References Cited                              |  |                          |                          |                          |                          |                          |
| U.S. PATENT DOCUMENTS  |   |  |                          |                          |                          |                          |                          |
| 3,725,884 4/1973 Gertin, ... 10/174                                |   |  |                          |                          |                          |                          |                          |

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**CASE NOTES IN CASE: DEMONSTRATION**

**ALL CASE NOTES IN CASE:**

|                                      |
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| <input type="checkbox"/> CASE NOTE 0 |
| <input type="checkbox"/> CASE NOTE 1 |
| <input type="checkbox"/> CASE NOTE 2 |

**SELECT A SINGLE CASE NOTE TO VIEW OR DELETE**

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FIG.71

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| PATENTWORKS WORKBENCH-DEMONSTRATION   |  |                                    |  |                          |                          |                          |                          |
|---|--|------------------------------------|--|--------------------------|--------------------------|--------------------------|--------------------------|
| CASE  | EDIT   | PATENT                             | NOTE                                     | LIBRARY                  | VIEW                     | WINDOW                   | HELP                     |
| <input type="checkbox"/> DEMONSTRATION  | <input type="checkbox"/>                                   | <input type="checkbox"/> 4,760,478 | <input type="checkbox"/> COLUMN: B1 OF 6 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| - 4,760,478 COLUMN: B1 OF 6 <input type="checkbox"/>   |  |                                    |  |                          |                          |                          |                          |
| United States Patent [19] <input type="checkbox"/>   |  |                                    |  |                          |                          |                          |                          |
| Pd. et al. <input type="checkbox"/>  |  |                                    |  |                          |                          |                          |                          |
| [11]  | Patent Number  | 4,760,478                          |  |                          |                          |                          |                          |
| [45]  | Date of Patent   | Jul. 26, 1988                      |  |                          |                          |                          |                          |
| [54]  | VISCO-ELASTICALLY DAMPED MAGNETIC HEAD SUSPENSION ASSEMBLY |                                    |  |                          |                          |                          |                          |
| [75]  | Inventor:  | George S. Pal, Saratoga, CA        |  |                          |                          |                          |                          |
|   |  | Snyder, San Jose, CA               |  |                          |                          |                          |                          |
| [73]  | Assignee:  | International Business Machi       |  |                          |                          |                          |                          |
| [21]  | Appl. No.:   | 883,201                            |  |                          |                          |                          |                          |
| [22]  | Filed:   | Jul. 8, 1986                       |  |                          |                          |                          |                          |
|   |  | Related U.S. Application Data      |  |                          |                          |                          |                          |
| [63]  | Continuation of Ser. No. 480,997 Mar. abandoned.           |                                    |  |                          |                          |                          |                          |
| [51]  | Int. Cl. A   | G11B 5/18; G11B21/16               |  |                          |                          |                          |                          |
| [52]  | U.S. Cl.   | 360/104; 360/97                    |  |                          |                          |                          |                          |
| [58]  | Field of Search....  | 360/102-106, 97-99, 75, 78         |  |                          |                          |                          |                          |
| [56]  | References Cited   |                                    |  |                          |                          |                          |                          |
| <input type="checkbox"/>   |  |                                    |  |                          |                          |                          |                          |
| 994 <input type="checkbox"/>   |  |                                    |  |                          |                          |                          |                          |
| <div style="border: 1px solid black; padding: 5px; width: 100%;"> <div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-between;"> <span>CLOSE</span> <span><input type="checkbox"/></span> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; 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padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; padding: 2px; margin-top: 2px;"> <input type="checkbox"/> </div> <div style="border: 1px solid black; 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**SUBSTITUTE SHEET (RULE 26)**

FIG. 72

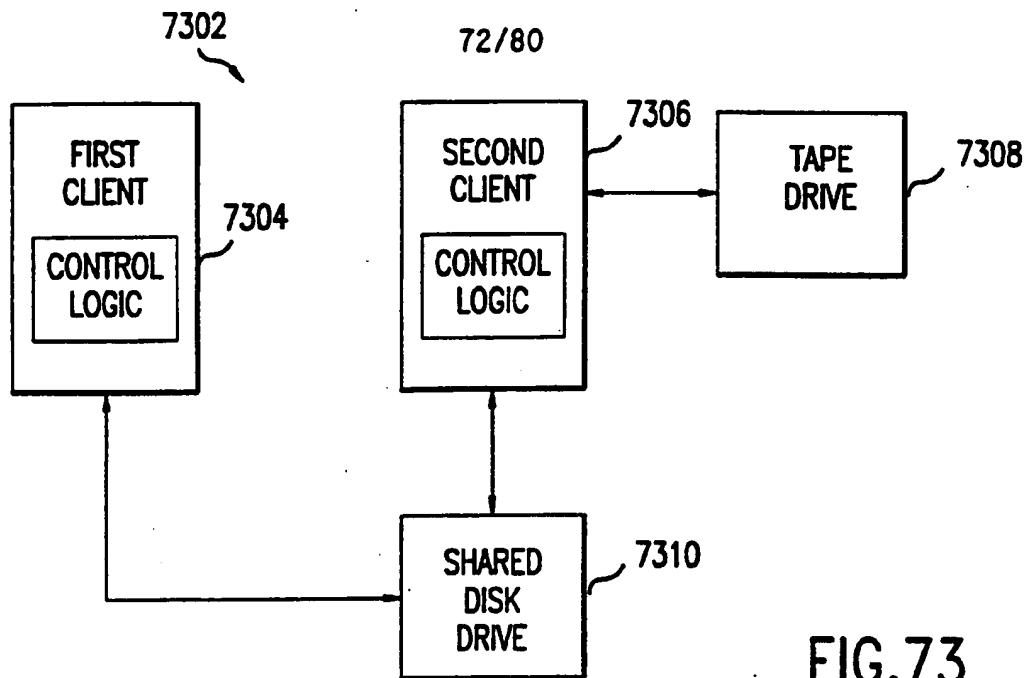


FIG.73

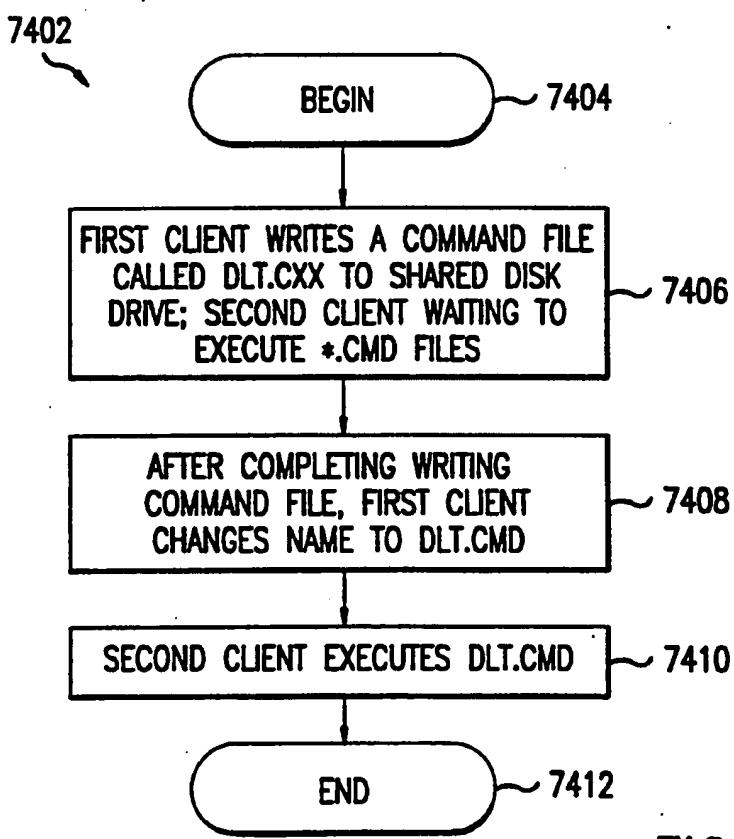


FIG.74

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7502

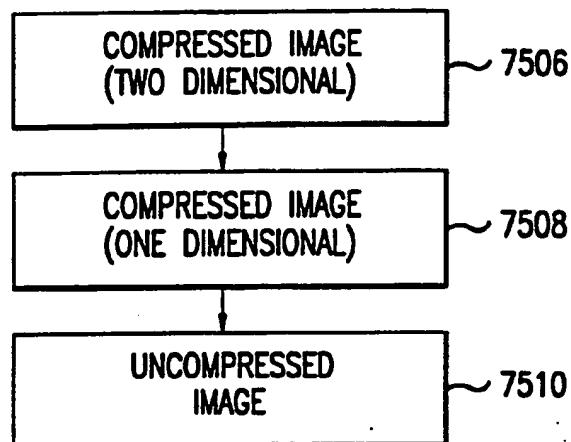


FIG.75

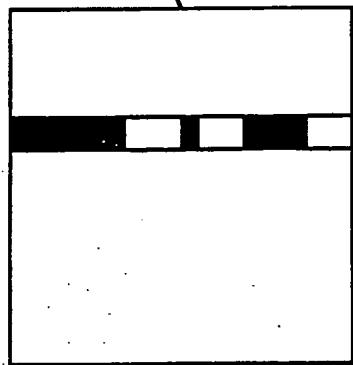
UNCOMPRESSED  
IMAGE 7602

FIG.76A

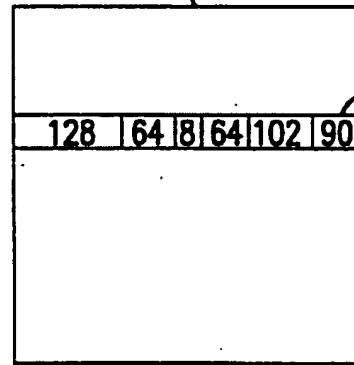
COMPRESSED  
IMAGE (1D) 7606

FIG.76B

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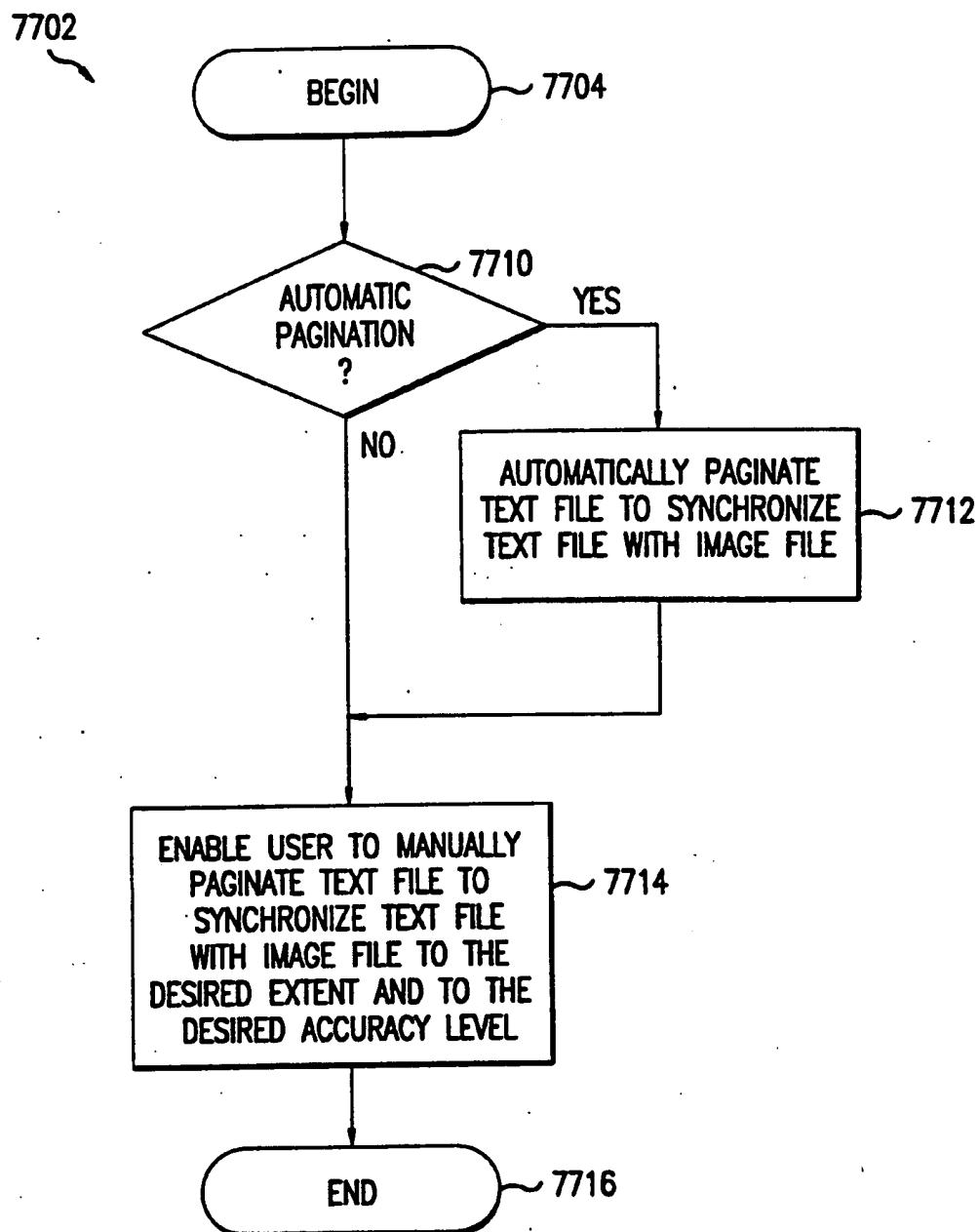


FIG.77

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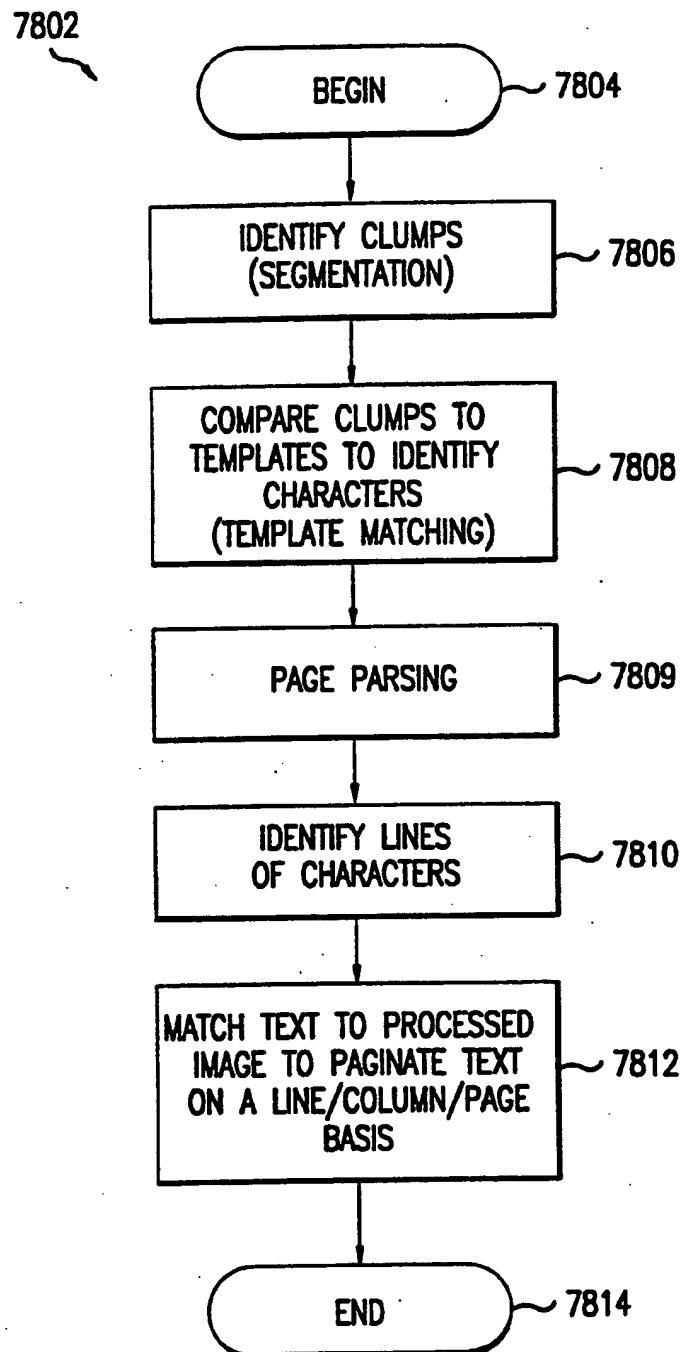


FIG.78

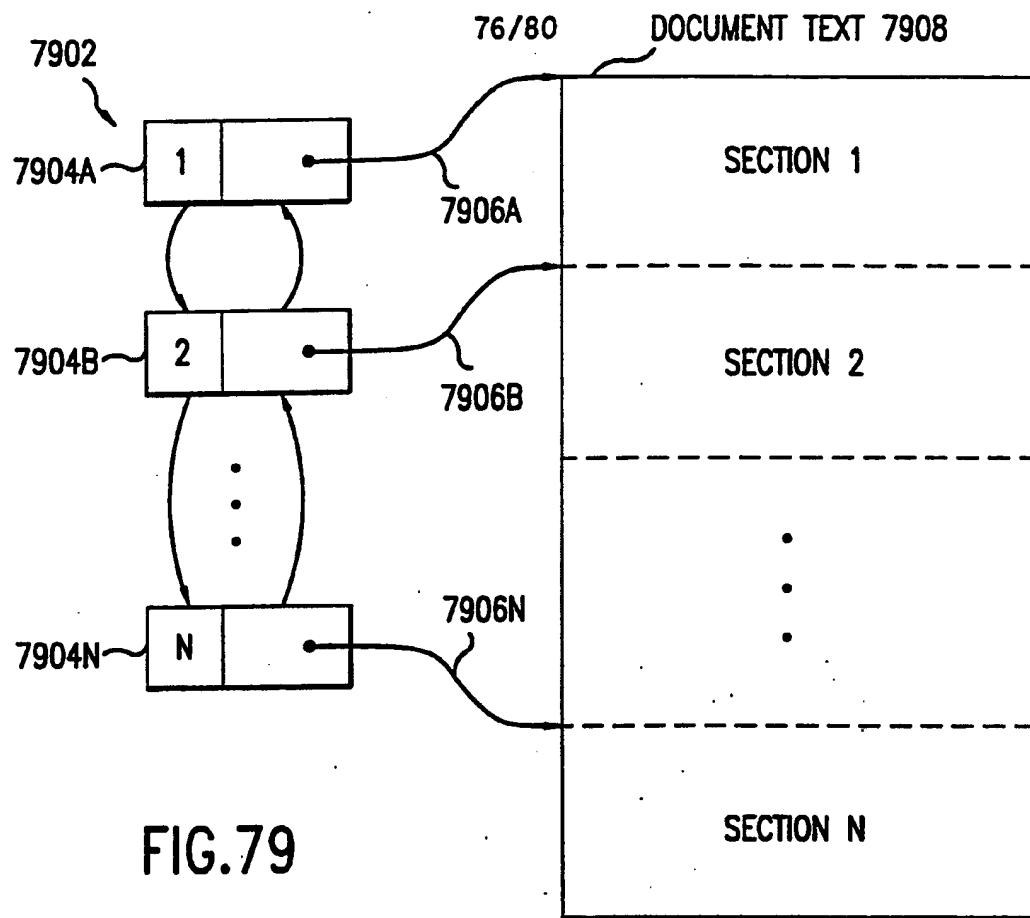


FIG.79

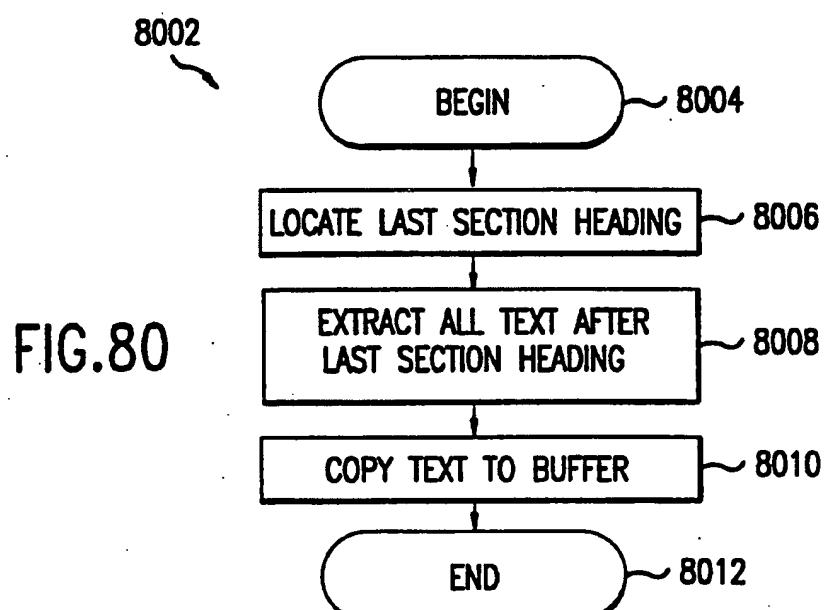
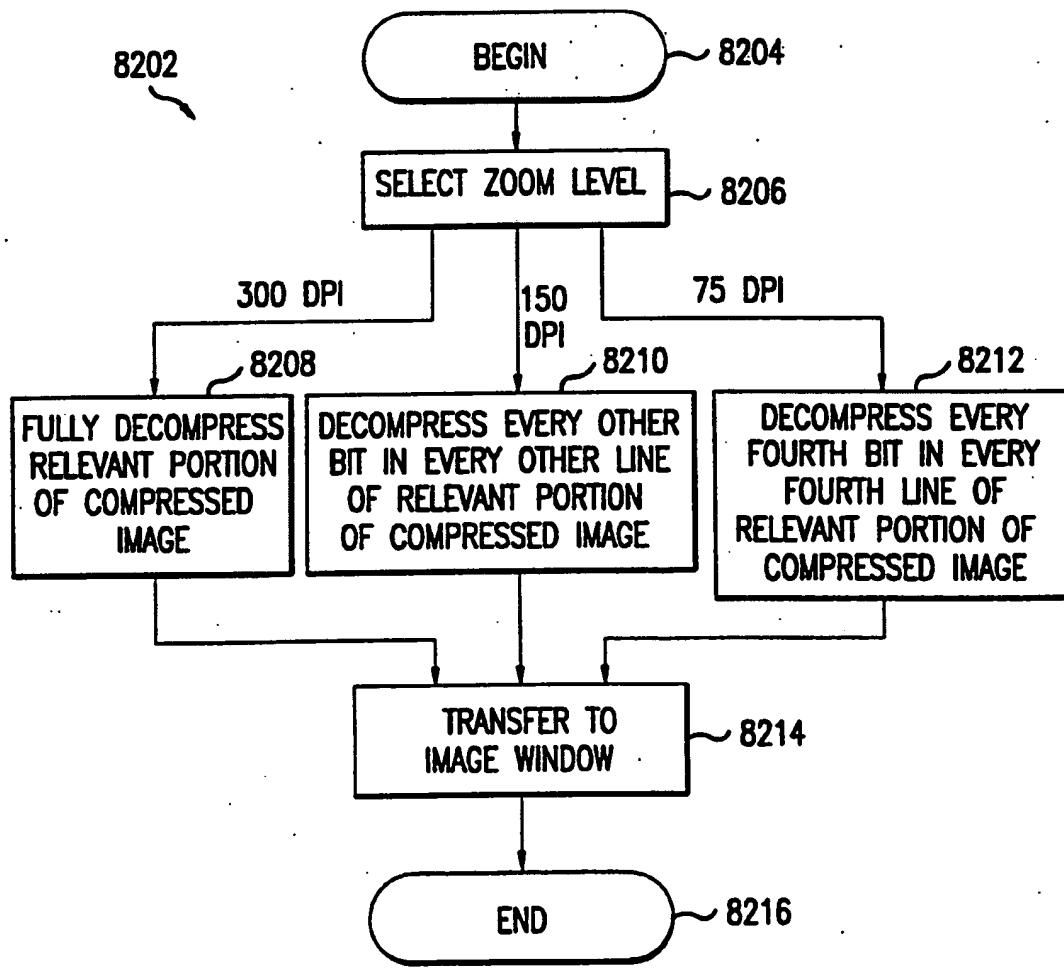
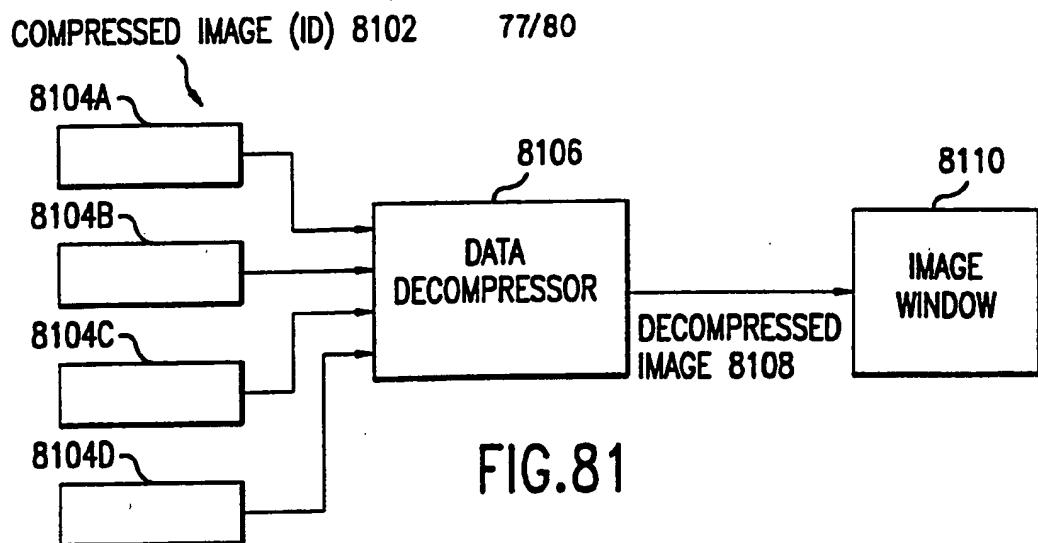


FIG.80

SUBSTITUTE SHEET (RULE 26)



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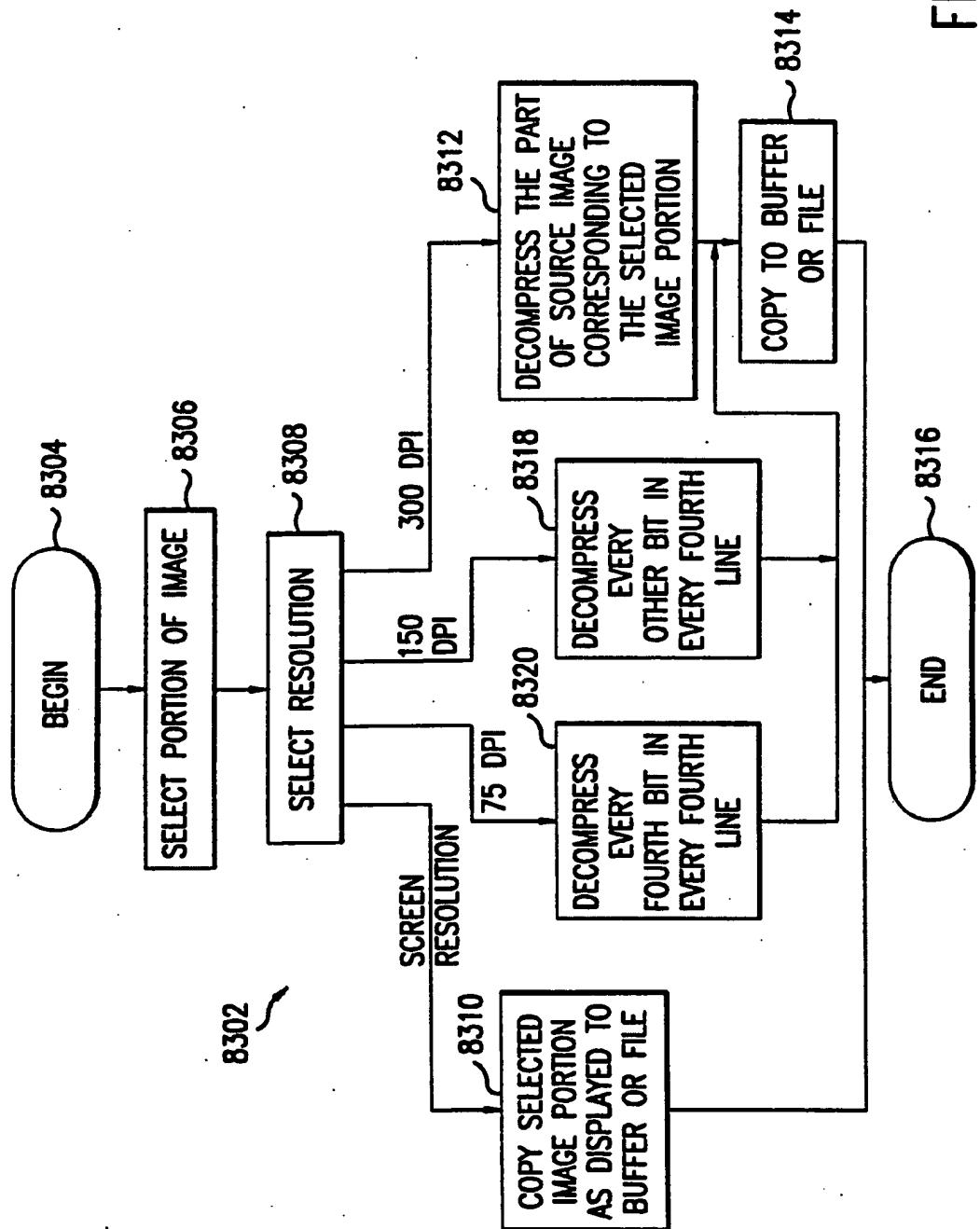


FIG. 83

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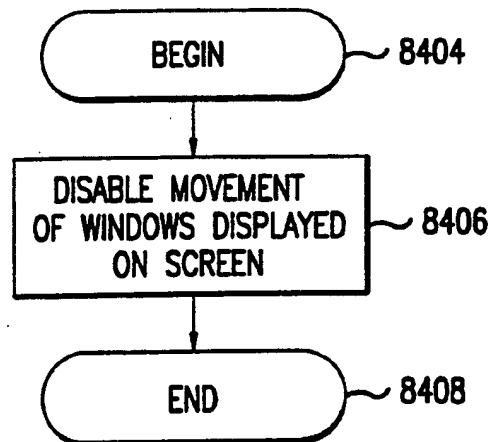


FIG.84

COMPRESSED IMAGE 8502

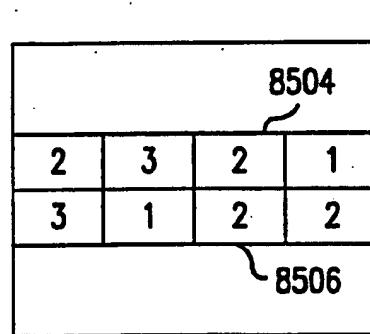


FIG.85A

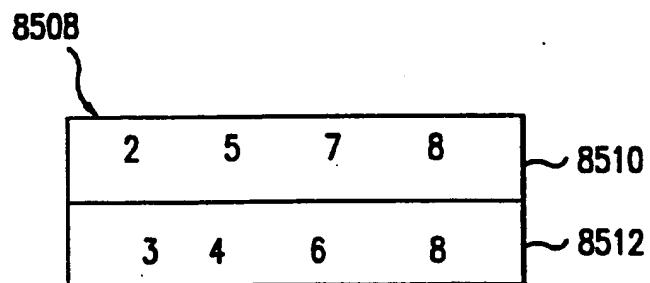
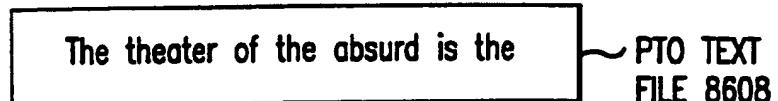
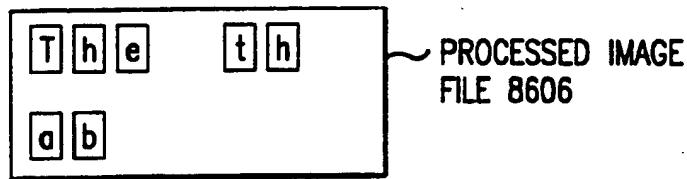


FIG.85B

SUBSTITUTE SHEET (RULE 26)

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## LOOK-UP TABLE 8610

|    |           |
|----|-----------|
| Th | 1         |
| he | 2,5,14,25 |
| th | 4,13,24   |
| ea | 6         |
| at | 7         |
| te | 8         |
| er | 9         |
| of | 11        |
| ab | 16        |
| bs | 17        |
| su | 18        |
| ur | 19        |
| rd | 20        |
| is | 22        |

## ANCHOR PAIR TABLE 8612

|    |           |
|----|-----------|
| Th | 1         |
| he | 2,5,14,25 |
| th | 4,13,24   |
| ab | 16        |

FIG.86

## INTERNATIONAL SEARCH REPORT

Internal Application No  
PCT/US 94/13454A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 G06F17/30

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|----------|---|-----------------------|
| X        | <p>WORLD PATENT INFORMATION,<br/>vol.13, no.3, 1991, MUNCHEN DE<br/>pages 152 - 154</p> <p>J.P. DINTZER ET AL. 'Image handling at the European Patent Office: Bacon and First Page'<br/>see page 154, column 1, line 4 - page 154, column 2, line 18; figure 2</p> <p>---</p> | 1-224                 |
| A        | <p>WORLD PATENT INFORMATION,<br/>vol.14, no.3, 1992, MUNCHEN DE<br/>pages 167 - 172</p> <p>J. LUCAS 'The progress of automation at the U.S. Patent and Trademark Office'<br/>see the whole document</p> <p>---</p> <p>-/-</p>   | 1-224                 |

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

## \*Special categories of cited documents:

- \*'A' document defining the general state of the art which is not considered to be of particular relevance
- \*'B' earlier document but published on or after the international filing date
- \*'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*'O' document referring to an oral disclosure, use, exhibition or other means
- \*'P' document published prior to the international filing date but later than the priority date claimed

- \*'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*'A' document member of the same patent family

|  |  |
|--|--|
| Date of the actual completion of the international search<br><br>27 March 1995   | Date of mailing of the international search report<br><br>04.04.95 |
| Name and mailing address of the ISA<br>European Patent Office, P.B. 5818 Patentiaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx 31 651 epo nl,<br>Fax (+31-70) 340-3016 | Authorized officer<br><br>Katerbau, R                              |

## INTERNATIONAL SEARCH REPORT

Internal Application No  
PCT/US 94/13454

## C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|----------|---|-----------------------|
| A        | WORLD PATENT INFORMATION,<br>vol.12, no.3, 1990, MUNCHEN DE<br>pages 155 - 157<br>C. JONCKHEERE 'EPOQUE (EPO QUERy service)<br>the Inhouse Host Computer of the European<br>Patent Office'<br>see the whole document<br>----- | 1-224                 |